THE

Mariners-Compaſs

RECTIFIED.

Containing TABLES ſhewing the true Hour of the Day, the Sun being upon any Point of the Compaſs: With the true time of the *Riſing* and *Setting* of the *Sun* and *Stars*, and the Points of the *Compaſs* that the *Sun* and *Stars* riſe and ſet with: And Tables of *Amplitude*. All which Tables are Calculated from the *Equinoctial* to 60 deg. of Latitude.

Hereunto is added an

APPENDIX,

Containing the Deſcription and Uſe of thoſe Inſtruments moſt in Uſe in the Art of *Navigation*,

With a TABLE of the *Latitude* and *Longitude* of Places: Compoſed after a new Order.

By Andrew Wakely, *Math.*

Carefully Corrected, Altered, and very much Enlarged, with many uſeful Additions,

By *Ja. Atkinſon*, Teacher of the Mathematicks.

LONDON,

Printed by *J. D.* for *Richard Mount* at the *Poſtern* on *Tower-Hill*, where you may have all ſorts of Sea-Books. 1696.

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AT *Cherry-Garden-Stairs* on *Rotherhith-Wall*, are taught theſe Mathematical Sciences,

Viz. { *Arithmetick*, *Geometry*, *Trigonometry*, *Dialling*, *Navigation*, *Aſtronomy*, *Merchants Accompts*, *Algebra*, *Surveying*, *Gauging*, *Gunnery*, *Fortification*: }

The Uſe of the *Globes*, and all other Mathematical Inſtruments; the Projection of the *Sphere* on any Circle,

By *JAMES ATKINSON.*

There Youth may be Boarded; and thoſe that deſire it may be taught at their own Dwellings.

There are alſo made and ſold all ſorts of Mathematical Inſtruments, in *Wood*, or *Braſs*; for *Sea* and *Land*; with *Books* to ſhew the Uſe of them where alſo you may have all ſorts of *Mapps*, *Plats*, *Sea-Charts* in *Plain* or *Mercator*, on reaſonable Terms.

To the Reverend

Mr. SAMUEL STANCLIFF

Miniſter of the Goſpel in *Bermondſey* near *Rotherhith.*

Reverend Sir,

TO be always in readineſs to render a Reaſon of our *Chriſtian Faith,* is a known Duty; yet even that *Divine Precept* obligeth not to every Perſon, for then would be a neceſſity to caſt Pearls before Swine; much leſs is there a Law to gratify every Queriſt.

And haply I may be unable (in the preſent Caſe) to anſwer every captious Inquirer, that may query, why this? or why to him? Yet thus much I will venture to ſay; That,

As there is no neceſſity for my *Plodding* on in the (almoſt forſaken) *High-way* of the *Antients,* to ſhelter this Treatiſe under the Wing of the greateſt Proficient, ſeeing it hath paſſed ſeveral Impreſſions with good Eſteem: So I have turned from (being averſe to) the *broad Road* of our preſent Time-ſervers, who in their flouriſhing Flatteries gallop ſo thick for Honours and Preferments, that it's hazardous for a ſober Traveller to jog on that way. But,

To be out of the Noiſe and Spattering of ſuch Hot-Spurs, (and in imitation of the deceaſed Author; though upon more powerful Motives) I take to this ſolitary *Foot-Path*; hoping, Sir, you will paſs a favourable Conſtruction on my honeſt Intention, which in truth is but the leaſt part of my Debt, and but a little of the leaſt your due; thus publickly acknowledging the greatneſs of that Mercy and remarkable Providence effecting it, to be a *Diſciple* of ſo *faithful and excellent a Diſpenſer of the Divine Oracles.*

For if our *Author* in his Epiſtle to the Reverend Dr. *Parr* late Rector of St. *Mary Magdalen Bermondſey*; to uſe his words,

" If *Alexander* was ſo much engaged to *Ariſtotle*, inſomuch that " it became a Queſtion, whether he owed not more to him " than to his Father *Philip*, and that only becauſe he inſtructed " him in *Natural Philoſophy*: How much more are we of the " Pariſh of *Bermondſey* engaged to you, for the great and ex- " traordinary Pains you are pleaſed to take among us, in " teaching and inſtructing us in *Divinity*, to the ſaving our Souls? What Obligations to Thankfulneſs and Duty, both to God and you, lieth on *Bermondſey* and Parts adjacent, for that elaborate Work, which through Divine Aſſiſtance you conſtantly perform among them?

I heartily wiſh as great a Bleſſing may attend your Miniſtry, and make it as remarkable as your Call; that as this Book is uſeful and neceſſary to rectify our Mariners Compaſs, and hath taught many to ſhape a ſafe and ſure Courſe to their deſired Haven; ſo may you be much more ſucceſsful in directing the Tribe of *Zebulun* (who are a conſiderable Part of your Auditory) to rectify all the natural and accidental Variations of the Compaſs of their Lives and Converſations, and help them to ſteer a ſafe and ſecure, a direct and ſteady Courſe for the Haven of eternal Reſt, Peace and Happineſs, by Faith in God, through our Lord Jeſus, is not only the hearty Deſire, but daily Prayer of,

SIR,

Your moſt humble Auditor,

Cherry-Garden-ſtairs on *Rotherith-Wall*, *Sept.* 7. 1693.

James Atkinſon.

To

To the READER.

Courteous Reader,

WHEN I first entred upon these my Labours, and after I had begun the Calculation, I found, that tho the Book be small, yet my Labour was so great, that I almost fainted. Yet at length, when I considered the ordinary, necessary, and frequent Use that might be made of these my Labours, I was hereby encouraged to go on and prosecute my Work; and how ready and easy I have made it for actual Performance, will plainly appear by immediate inspection, to the meanest Capacity.

Here follows a brief Explanation of the Method and Order of the Book. First, You will find Tables of the Sun's Declination, newly Calculated from the best Hypothesis yet discovered, and applied to the Meridian of London, *whose Latitude is* 51 d. 32 m. *and Longitude according to my Table* 0 d. 0 m. *Next you will find Tables shewing the true Hour and Minute of the Day, the Sun being upon any Point of the Compass; which Tables are as Dials, fitting all Places in the World, whose Pole is elevated not above* 60 d. *either North or South. Likewise by these Tables you may know the true Hour and Minute of the Night, by the bearing of any of the known fixed Stars between the Tropicks. Then you will find Tables shewing the true Time of the Sun's Rising and Setting, with the Length of the Day and Night. Also by these Tables you may find the true Time of Rising and Setting of all the eminent fixed Stars between the Tropicks. Next you will find Tables shewing the Points of the Compass that the Sun and all the abovesaid Stars rise and set with; which Tables are of excellent use for the ready finding of the Variation of the Compass, and may be performed by a Meridian-Compass that is about ten Inches in Diameter, whose Points being divided into halfs and quarters; such a Compass I suppose to be convenient for the Mariners use, where he hath not an Azimuth-Compass. Next you will find Tables of Amplitudes to every Degree of the Sun's Declination. All these Tables are calculated from the Equinoctial to sixty Degrees of Latitude, either North or South, and they will last with Exactness as long as God upholdeth the Order and Course of Nature.*

In the Appendix *you will find the use of all those Instruments that are most in use in the Art of Navigation, either for Operation or Observation. Likewise a Table containing the most and chiefest Harbours, Headlands, and Islands in the world, shewing the* Latitude *and* Longitude *of each of them, beginning the Longitude at the Meridian of* London, *newly composed in a new successive Order.*

This Method I own, but how I have acquitted my self therein, I shall leave to the Judgments and Experiments of the skilfullest Mariners that the World affords, which are my native Country-men of England.

Courteous Friends,

Fare ever well, so ever wishes he,
Who is more yours, than he can seem to be,

Rotherith-Wall,
♂ 13. Sept. 1664. *Andrew Wakely.*

The Corrector *to the* Reader.

Candid Reader,

BEING desired by the Bookseller concerned herein, I willingly undertook the Viewing and Correcting of this Treatise, (and the rather for that respect I bear, to the Memory of my Master the deceased Author) which for its Usefulness hath obtained good Esteem with our Navigators: I therefore have took the greater Pains, spent much Time, in examining each Table; correcting, mending, altering, explaining, and in enlarging where I saw cause; having endeavoured to render the whole of the *Mariners-Compass Rectified* most familiar and easy to an ordinary Capacity.

In this Edition I have contracted the *Tables of Amplitudes in Points of the Compass*, and yet as intelligible as before; by which having made more room, I have made the Reader amends with large Additions in the Uses of each Table, and methodizing the Discourse throughout: but most especially in the *Appendix*, where I have taken the liberty to repair, alter, and enlarge, that it will

will appear as good as new; but chiefly in the *Diſcription and Uſe of the Gunter, Sliding-Gunter, and Sector:* principally the two former; whoſe Uſes I have ſhewed in *Arithmetick*, to *Multiply*, *Divide*, and work the *Rule of Three*; in *Geometry*, to work *Proportions*, *Continual*, *Duplicate* or *Triplicate*; *Menſuration* of *Superficies*, and *Solids*; as to meaſure *Board*, *Timber*, *Stone*, *Gauging* of *Veſſels*, and *Tunnaging* of *Ships*, *Bails* or *Boxes:* Alſo in *Gunnery*. And in *Navigation*, both in *Plain* and *Mercators Sailing:* In *Aſtronomy*, in the moſt uſeful Problems; as to find the *Sun's* Place, Declination, Riſing, Setting, Amplitude, Azimuth, Hour, and Altitude at all times. And in all you are directed plainly to perform them, both by Sliding-Gunter, and with Compaſſes.

In the *Table of Latitude and Longitude* I have added many Places of note, and omitted ſome few that were of little moment, and have corrected both the Latitudes and Longitudes of the moſt eminent, according to the lateſt Obſervations; ſo that I am bold to ſay, it's the moſt exact Table of its kind extant.

Reader. Theſe with many other *Additions* through the whole, I hope will find Acceptance with *Young Students* in the *Mathematicks*, and prove ſerviceable to them both in their *Studies* and *Practice* of *Navigation*, and other parts of the *Mathematicks*; for whoſe ſakes I took the greater Pains herein, who am an obliged Servant to teach them what may here be wanting.

♀ 8th *Sept.* 1693. *James Atkinſon.*

Leap Years.

Sun's Declination, 1692. 1696. 1700. 1704.

Days.	January South.		February South.		March. South.		April. North.		May. North.		June. North.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	21	48	13	58	03	15	08	44	18	11	23	12
2	21	38	13	38	02	51	09	06	18	26	23	16
3	21	28	13	18	02	28	09	27	18	40	23	19
4	21	18	12	58	02	04	09	49	18	55	23	22
5	21	07	12	37	01	41	10	10	19	09	23	24
6	20	57	12	16	01	17	10	31	19	22	23	26
7	20	44	11	55	00	53	10	52	19	36	23	28
8	20	32	11	34	00	29	11	13	19	49	23	29
9	20	19	11	13	00	06	11	34	20	02	23	30
10	20	06	10	51	Nor.	18	11	54	20	14	23	30
11	19	53	10	30	00	42	12	15	20	26	23	30
12	19	39	10	08	01	05	12	35	20	38	23	29
13	19	25	09	46	01	29	12	54	20	49	23	28
14	19	11	09	24	01	52	13	14	21	00	23	27
15	18	56	09	01	02	16	13	34	21	11	23	25
16	18	41	08	39	02	39	13	53	21	21	23	23
17	18	25	08	16	03	03	14	12	21	31	23	21
18	18	10	07	54	03	26	14	30	21	40	23	18
19	17	54	07	31	03	49	14	49	21	49	23	15
20	17	37	07	08	04	13	15	07	21	58	23	11
21	17	20	06	45	04	36	15	25	22	07	23	07
22	17	03	06	22	04	59	15	43	22	14	23	02
23	16	46	05	59	05	22	16	00	22	22	22	57
24	16	30	05	36	05	45	16	18	22	29	22	52
25	16	11	05	13	06	08	16	35	22	36	22	46
26	15	52	04	49	06	30	16	51	22	43	22	40
27	15	34	04	26	06	53	17	08	22	49	22	33
28	15	15	04	02	07	15	17	24	22	54	22	26
29	14	56	03	39	07	38	17	40	22	59	22	19
30	14	37			08	00	17	55	23	04	22	11
31	14	18			08	22			23	09		

Leap Years.

Sun's Declination, 1708. 1712. 1716. 1720.

Days.	July. North. D.	M.	August. North. D.	M.	Septemb. North. D.	M.	October. South. D.	M.	Novemb. South. D.	M.	Decemb. South. D.	M.
1	22	02	15	03	04	13	07	26	17	47	23	09
2	21	54	14	44	03	50	07	48	18	03	23	13
3	21	45	14	26	03	27	08	11	18	19	23	17
4	21	36	14	07	03	03	08	33	18	34	23	20
5	21	26	13	48	02	40	08	55	18	50	23	23
6	21	16	13	29	02	17	09	17	19	04	23	25
7	21	06	13	10	01	54	09	39	19	19	23	27
8	20	25	12	51	01	30	10	01	19	33	23	29
9	20	44	12	31	01	07	10	23	19	47	23	29
10	20	33	12	11	00	43	10	45	20	00	23	30
11	20	21	11	51	00	20	11	06	20	14	23	30
12	20	09	11	30	Sou.	31	11	27	20	26	23	29
13	19	56	11	10	00	27	11	48	20	39	23	28
14	19	44	10	40	00	51	12	09	20	51	23	27
15	19	31	10	28	01	14	12	30	21	02	23	25
16	19	17	10	07	01	38	12	50	21	13	23	23
17	19	03	09	46	02	01	13	11	21	24	23	20
18	18	49	09	25	02	25	13	31	21	34	23	16
19	18	35	09	03	02	48	13	51	21	44	23	13
20	18	20	08	42	03	11	14	10	21	54	23	08
21	18	06	08	20	03	35	14	30	22	03	23	04
22	17	50	07	58	03	58	14	49	22	12	22	58
23	17	35	07	36	04	21	15	08	22	20	22	53
24	17	19	07	14	04	45	15	27	22	28	22	47
25	17	03	06	52	05	08	15	45	22	35	22	40
26	16	46	06	29	05	31	16	03	22	42	22	33
27	16	30	06	07	05	54	16	21	22	49	22	26
28	16	13	05	44	06	17	16	39	22	55	22	18
29	15	56	05	22	06	40	16	56	23	00	22	09
30	15	38	04	59	07	03	17	13	23	05	22	01
31	15	21	04	36			17	30			21	52

First after Leap Year.

Sun's Declination, 1693. 1697. 1701. 1705.

Days.	*January* South.		*February* South.		*March.* South.		*April.* North.		*May.* North.		*June.* North.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	21	41	13	43	03	22	08	38	18	07	23	11
2	21	31	13	23	02	58	09	00	18	22	23	15
3	21	21	13	03	02	34	09	22	18	36	23	18
4	21	10	12	43	02	11	09	43	18	51	23	21
5	20	59	12	22	01	47	10	04	19	05	23	23
6	20	47	12	01	01	23	10	26	19	19	23	26
7	20	35	11	40	01	00	10	47	19	32	23	27
8	20	23	11	18	00	36	11	08	19	45	23	29
9	20	10	10	57	00	12	11	28	19	58	23	29
10	19	56	10	35	Nor.	12	11	49	20	11	23	30
11	19	43	10	14	00	35	12	09	20	23	23	30
12	19	29	09	52	00	59	12	29	20	34	23	30
13	19	15	09	30	01	22	12	49	20	46	23	29
14	19	00	09	07	01	46	13	09	20	57	23	28
15	18	45	08	45	02	10	13	28	21	08	23	26
16	18	30	08	23	02	33	13	47	21	18	23	24
17	18	14	08	00	02	56	14	07	21	28	23	22
18	17	58	07	37	03	20	14	25	21	38	23	19
19	17	42	07	14	03	42	14	44	21	47	23	16
20	17	25	06	51	04	06	15	02	21	56	23	12
21	17	08	06	28	04	30	15	20	22	04	23	08
22	16	51	06	05	04	53	15	38	22	12	23	03
23	16	33	05	42	05	16	16	56	22	20	22	58
24	16	15	05	19	05	39	16	13	22	27	22	53
25	15	57	04	56	06	01	16	30	22	34	22	48
26	15	39	04	32	06	24	16	47	22	41	22	41
27	15	20	04	09	06	47	17	03	22	47	22	35
28	15	01	03	45	07	09	17	20	22	53	22	28
29	14	42			07	32	17	36	22	58	22	21
30	14	23			07	54	17	51	23	03	22	13
31	14	03			08	16			23	08		

First after Leap Year.

Sun's Declination, 1709. 1713. 1717. 1721.

Days.	July. North.		August. North.		Septemb. North.		October. South.		Novemb. South.		Decemb. South.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	22	04	15	08	04	19	07	19	17	43	23	08
2	21	56	14	49	03	56	07	42	17	59	23	12
3	21	47	14	31	03	33	08	04	18	15	23	16
4	21	38	14	12	03	10	08	27	18	30	23	19
5	21	29	13	54	02	47	08	49	18	45	23	22
6	21	19	13	35	02	23	09	11	19	00	23	25
7	21	09	13	15	02	00	09	33	19	15	23	27
8	20	58	12	56	01	37	09	55	19	29	23	28
9	20	47	12	36	01	13	10	17	19	43	23	29
10	20	36	12	16	00	50	10	39	19	57	23	30
11	20	24	11	56	00	26	11	00	20	10	23	30
12	20	12	11	36	00	03	11	22	20	23	23	30
13	20	00	11	16	Sou.	21	11	43	20	35	23	29
14	19	47	10	55	00	44	12	04	20	47	23	28
15	19	34	10	34	01	08	12	24	20	59	23	26
16	19	21	10	13	01	31	12	45	21	01	23	23
17	19	07	09	52	01	55	13	05	21	21	23	21
18	18	53	09	31	02	18	13	25	21	32	23	17
19	18	39	09	09	02	42	13	45	21	42	23	14
20	18	24	08	48	03	05	14	05	21	51	23	10
21	18	10	08	26	03	28	14	25	22	01	23	05
22	17	55	08	04	03	52	14	44	22	09	23	00
23	17	39	07	42	04	15	15	03	22	18	22	54
24	17	23	07	20	04	38	15	22	22	26	22	48
25	17	07	06	58	05	02	15	40	22	33	22	42
26	16	51	06	35	05	25	15	59	22	40	22	35
27	16	34	06	13	05	48	16	17	22	47	22	28
28	16	18	05	50	06	11	16	34	22	53	22	20
29	16	00	05	28	06	34	16	52	22	59	22	12
30	15	43	05	05	06	57	17	09	23	04	22	03
31	15	26	04	42			17	26			21	54

Second after Leap Year.

Sun's Declination, 1694. 1698. 1702. 1706.

Days.	January South.		February South.		March. South.		April. North.		May. North.		June. North.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	21	44	13	48	03	27	08	33	18	03	23	10
2	21	33	13	28	03	04	08	55	18	18	23	14
3	21	23	13	08	02	40	09	16	18	33	23	17
4	21	13	12	48	02	16	09	38	18	47	23	20
5	21	01	12	27	01	53	09	59	19	01	23	23
6	20	50	12	06	01	29	10	21	19	15	23	25
7	20	38	11	45	01	05	10	42	19	29	23	27
8	20	26	11	24	00	42	11	03	19	42	23	28
9	20	13	11	02	00	18	11	23	19	55	23	29
10	20	00	10	41	Nor.	06	11	44	20	08	23	30
11	19	46	10	19	00	29	12	05	20	20	23	30
12	19	32	09	57	00	53	12	24	20	32	23	30
13	19	18	09	35	01	17	12	44	20	43	23	29
14	19	04	09	13	01	40	13	04	20	54	23	28
15	18	49	08	51	02	04	13	24	21	05	23	26
16	18	33	08	28	02	27	13	43	21	16	23	25
17	18	18	08	05	02	51	14	02	21	26	23	22
18	18	02	07	43	03	14	14	21	21	35	23	19
19	17	46	07	20	03	38	14	39	21	45	23	16
20	17	29	06	57	04	01	14	58	21	54	23	13
21	17	12	06	34	04	24	15	16	22	02	23	09
22	16	55	06	11	04	47	15	34	22	10	23	04
23	16	38	05	48	05	10	15	52	22	18	23	00
24	16	20	05	25	05	33	16	09	22	26	22	54
25	16	02	05	01	05	56	16	26	22	33	22	49
26	15	43	04	38	06	19	16	43	22	39	22	43
27	15	25	04	14	06	41	16	59	22	46	22	37
28	15	06	03	51	07	04	17	16	22	52	22	30
29	14	47			07	26	17	32	22	57	22	23
30	14	28			07	49	17	47	23	02	22	15
31	14	08			08	11			23	07		

Second after Leap Year.

Sun's Declination, 1710. 1714. 1718. 1722.

Days.	July. North.		August. North.		Septemb. North.		October. South.		Novemb. South.		Decemb. South.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	22	06	15	12	04	25	07	14	17	38	23	07
2	21	58	14	54	04	02	07	36	17	55	23	11
3	21	49	14	36	03	39	07	59	18	11	23	15
4	21	40	14	17	03	15	08	22	18	26	23	19
5	21	31	13	58	02	52	08	44	18	42	23	22
6	21	21	13	39	02	29	09	06	18	57	23	24
7	21	11	13	20	02	06	09	28	19	12	23	26
8	21	01	13	01	01	42	09	50	19	26	23	28
9	20	50	12	41	01	19	10	12	19	40	23	29
10	20	39	12	21	00	56	10	34	19	54	23	30
11	20	27	12	01	00	32	10	55	20	07	23	30
12	20	15	11	41	00	09	11	16	20	20	23	30
13	20	03	11	21	Sou.	15	11	38	20	32	23	29
14	19	50	11	00	00	38	11	59	20	54	23	28
15	19	37	10	39	01	02	12	19	20	56	23	26
16	19	24	10	18	01	25	12	40	21	08	23	24
17	19	11	09	57	01	49	13	00	21	19	23	21
18	18	57	09	36	02	12	13	21	21	29	23	18
19	18	43	09	15	02	36	13	41	21	39	23	15
20	18	28	08	53	02	59	14	00	21	49	23	11
21	18	13	08	31	03	23	14	20	21	58	23	06
22	17	58	08	09	03	46	14	39	22	07	23	01
23	17	43	07	47	04	09	14	58	22	16	22	56
24	17	27	07	25	04	33	15	17	22	24	22	50
25	17	11	07	03	04	56	15	36	22	31	22	44
26	16	54	06	41	05	19	15	54	22	39	22	37
27	16	38	06	18	05	42	16	12	22	45	22	30
28	16	22	05	56	06	05	16	30	22	52	22	22
29	16	05	05	33	06	28	16	48	22	57	22	14
30	15	47	05	10	06	51	17	05	23	03	22	05
31	15	30	04	48			17	22			21	56

Third after Leap Year.

Sun's Declination, 1695. 1699. 1703. 1707.

Days.	*January* South.		*February* South.		*March.* South.		*April.* North.		*May.* North.		*June.* North.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	21	46	13	53	03	33	08	27	17	59	23	09
2	21	36	13	33	03	09	08	49	18	14	23	13
3	21	26	13	13	02	46	09	11	18	29	23	16
4	21	15	12	53	02	22	09	33	18	44	23	20
5	21	04	12	32	01	58	09	54	18	58	23	23
6	20	53	12	10	01	35	10	15	19	12	23	25
7	20	41	11	50	01	11	10	37	19	26	23	27
8	20	29	11	29	00	47	10	57	19	39	23	28
9	20	16	11	08	00	24	11	18	19	52	23	29
10	20	03	10	46	00	00	11	39	20	05	23	30
11	19	50	10	24	Nor.	24	11	59	20	17	23	30
12	19	36	10	02	00	47	12	19	20	29	23	30
13	19	22	09	40	01	11	12	39	20	40	23	29
14	19	07	09	18	01	35	12	59	20	52	23	28
15	18	52	08	56	01	58	13	19	21	03	23	27
16	18	37	08	34	02	22	13	38	21	13	23	25
17	18	22	08	11	02	45	13	57	21	23	23	23
18	18	06	07	48	03	09	14	16	21	33	23	20
19	17	50	07	26	03	32	14	35	21	42	23	17
20	17	33	07	03	03	55	14	53	21	51	23	14
21	17	16	06	40	04	18	15	12	22	00	23	10
22	16	59	06	17	04	42	15	30	22	08	23	06
23	16	42	05	53	05	05	15	47	22	16	23	01
24	16	24	05	30	05	28	16	05	22	24	22	56
25	16	06	05	07	05	50	16	22	22	31	22	50
26	15	48	04	43	06	13	16	39	22	38	22	44
27	15	29	04	20	06	36	16	55	22	44	22	38
28	15	11	03	57	06	58	17	12	22	50	22	32
29	14	52			07	21	17	28	22	56	22	25
30	14	32			07	43	17	44	23	01	22	17
31	14	13			08	05			23	06		

Third after Leap Year.

Sun's Declination, 1711. 1715. 1719. 1723.

Days.	July. North.		August. North.		Septemb. North.		October. South.		Novemb. South.		Decemb. South.	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	22	08	15	16	04	30	07	08	17	34	23	05
2	22	00	14	58	04	07	07	31	17	51	23	10
3	21	52	14	40	03	44	07	54	18	07	23	14
4	21	43	14	22	03	21	08	16	18	23	23	18
5	21	33	14	03	02	58	08	38	18	38	23	21
6	21	24	13	44	02	35	09	01	18	53	23	24
7	21	14	13	25	02	11	09	23	19	08	23	26
8	21	03	13	05	01	48	09	45	19	22	23	28
9	20	52	12	46	01	25	10	07	19	37	23	29
10	20	41	12	26	01	01	10	28	19	50	23	30
11	20	30	12	06	00	38	10	50	20	04	23	30
12	20	18	11	46	00	14	11	11	20	17	23	30
13	20	06	11	26	Sou.	09	11	32	20	29	23	29
14	19	53	11	05	00	33	11	53	20	41	23	28
15	19	41	10	44	00	56	12	14	20	53	23	27
16	19	27	10	23	01	20	12	35	21	05	23	25
17	19	14	10	02	01	43	12	55	21	16	23	22
18	19	00	09	14	02	07	13	16	21	27	23	19
19	18	46	09	20	02	30	13	36	21	37	23	16
20	18	32	08	58	02	54	13	56	21	47	23	12
21	18	17	08	37	03	17	14	15	21	56	23	07
22	18	02	08	15	03	40	14	34	22	05	23	02
23	17	47	07	53	04	04	14	54	22	14	22	57
24	17	31	07	31	04	27	15	13	22	22	22	51
25	17	15	07	09	04	50	15	31	22	30	22	45
26	16	59	06	46	05	14	15	50	22	37	22	39
27	16	42	06	24	05	37	16	08	22	44	22	32
28	16	26	06	01	06	00	16	25	22	50	22	24
29	16	09	05	39	06	23	16	43	22	56	22	16
30	15	52	05	16	06	46	17	01	23	01	22	07
31	15	34	04	53			17	18			21	59

The Deſcription and Uſe of the Tables of the Sun's Declination.

BEcauſe in the following parts of this Book, the Sun's *Declination* is as an Index to the whole; I therefore thought it fit to place theſe foregoing Tables in the Front of my Labours: Whereof the firſt Table ſheweth the Sun's *Declination* for every day in the Year, for all theſe following Leap-Years, 1692, 1696, 1700, 1704, 1708, 1712, 1716, 1720; and the ſecond for the firſt Years after the Leap-Years, as, namely, 1693, 1697, 1701, 1705, 1709, 1713, 1717, 1721; and the third for the ſecond Years after the Leap-Years, which are theſe, 1694, 1698, 1702, 1706, 1710, 1714, 1718, 1722; and the fourth Table ſheweth the Sun's *Declination* for the third Years after the Leap-Years, which are 1695, 1699, 1703, 1707, 1711, 1715, 1719, 1723, as you may ſee them plainly expreſſed in the head of each Table. Now for to find the Sun's *Declination* for any day in the Year, in any of the Years above-ſaid, you muſt look for the Year and Month in the head of the Table, and look for the day of the Month in the left hand of the Table, and in the common Angle of meeting, you will find the *Declination* that you ſeek after.

A

A Table whereby you may proportion the Sun's Declination to any other Meridian.

Degrees of Longitude.	The daily difference in Declination.											
	m. 2 m.	m. 4 m.	m. 6 m.	m. 8 m.	m. 10 m.	m. 12 m.	m. 14 m.	m. 16 m.	m. 18 m.	m. 20 m.	m. 22 m.	m. 24 m.
15	0	0	0	0	0	0	1	1	1	1	1	1
30	0	0	0	1	1	1	1	1	1	2	2	2
45	0	0	1	1	1	1	2	2	2	2	3	3
60	0	1	1	1	2	2	2	3	3	3	4	4
75	0	1	1	2	2	2	3	3	4	4	5	5
90	0	1	1	2	2	3	3	4	4	5	5	6
105	1	1	2	2	3	3	4	5	5	6	6	7
120	1	1	2	3	3	4	5	5	6	7	7	8
135	1	1	2	3	4	4	5	6	7	7	8	9
150	1	2	2	3	4	5	6	7	7	8	9	10
165	1	2	3	4	5	5	6	7	8	9	10	11
180	1	2	3	4	5	6	7	8	9	10	11	12

East. / West. — Lon with Decl. — Incr. / Decr. — Subtr. but Decl. — Decr. / Incr. — add

The uſe that may be made of this Table of Proportion.

THE Tables of the Sun's *Declination* are calculated for the *Meridian* of *London*, and will ſerve any Place under that *Meridian*; but for thoſe Places ſituate Eaſterly or Wetterly from it, the *Declination* muſt be proportioned according to its daily *Difference*, and the *Longitude* of thoſe Places from the *Meridian* of *London*; for which purpoſe this Table is uſeful, as it's evident by theſe Examples following.

Exam. 1. Admit the 10*th* day of *April*, *An.* 1692. I am in Longit. 105 d. eaſt; I demand what Declination the Sun will have that day in the Meridian of the Place?

The Decli. for *April* 10. in the Meridian of *London* is 11 d. 54 m. increaſing, and the daily Difference at that time, is 21 m. therefore in this Table, I look in the head thereof for the neareſt number to 21 m. which is 20 m. then I look on the left hand of the Table for 105 d. the Longit. that I am in, and in the common Angle of meeting, I find 6, which is to be deducted from the Declination in the Meridian of *London* aforeſaid, 11 d. 54 m. and the Remainder will be the Declination for that Meridian, or the Longit. that I am in, which is 11 d. 48 m. North. But if the Declination had decreaſed, as it doth here increaſe, then you muſt have added as here under you may ſee.

	d.	*m.*	
The Declination *in the Meridian of* London,	11	54	N.
The proportional minutes ſubtract,	00	06	
The Decli. *for the Longit. of* 105 *deg.* E is	11	48	N.
The Decli. *for the Longit. of* 105 *deg.* W. is	12	00	N.

Example 2.

Admit the 10*th* day of *October*, *An.* 1694. I am in Longitude 87 d. Weſt, I demand the Declination that the Sun will have that day in that Meridian?

	d.	*m.*	
The Declination *in the Meridian of* London,	10	34	S.
The proportional minutes, add ——·——	00	05	
The Decli. *in the Longitude of* 87 *d.* W. is	10	39	S.
The Decli. *in the Longitude of* 87 *d.* E. is	10	29	S.

A Table of the Refractions of Sun, Moon, and Stars, according to the Obſervation of Tycho Brahe.

Alti-tudes.	Sun ′	Moon. ′	Stars. ′	Alti-tudes.	Sun ′	Moon. ′
0	34	33	30	18	06	06
1	26	25	21	19	05	06
2	20	20	15	20	04	05
3	17	17	12	21	04	05
4	15	15	11	22	03	04
5	14	14	10	23	03	04
6	13	13	09	24	03	04
7	12	13	08	25	02	03
8	11	12	07	26	02	03
9	10	11	06	27	02	03
10	10	11	05	28	02	02
11	09	10	05	29	02	02
12	09	09	04	30	01	02
13	08	09	04	31	01	02
14	08	08	03	32	01	01
15	07	08	03	33	01	01
16	07	07	02	34	01	01
17	06	07	02	35	01	01

The Refraction of the *Sun*, *Moon*, and *Stars*, cauſeth them to appear higher above the *Horizon* than they are; therefore the Refraction is always to be ſubtracted from the *Altitude* obſerved, that the true *Altitude* may be had.

As admit the Sun's Meridian Altitude, by Obſervation, to be 5 deg. I demand the true Altitude?

	d.	m.
Altitude by Obſervation	05	00
Refraction, Subtract	00	14
The true Meridian Altitude	04	46

Primum Mobile:

OR,

Aſtronomical Tables;

Each TABLE being a SUN-DIAL:

Shewing

The exact Hour of the Day, the Sun being upon any Point of the Compaſs, fitting all Places upon the Earth and Sea, that lie between the *Equinoctial* and 60 *deg.* of *Latitude*, either *North* and *South*: and to laſt with exactneſs as long as the Great and Everlaſting Creator ſhall be pleaſed to hold together the great and wonderful Fabrick of Nature.

A Sun-Dial for the Latitude of 0 *Degree.*

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nort.		12	12	12	12	12	12	12	12	12	12
n *by* w		0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
n n w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.42
nw *bn*		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.00
n w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.36	1.47
nw *bw*		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.32	2.52
w n w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.07	
w *by* n		0.51	1.44	2.46	4.10						
West.	6.00										
☉ ſet	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Sun's	h. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	2.30	5.00	7.30	10.0	12.30	15.0	17.30	20.0	22.30	23.30

Zen. Weſt.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m		30m	
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w		0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
s s w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.42
sw *by* s		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.08
s w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.35	1.47
sw *by* w		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.32	2.52
w s w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.07	
w *by* s		0.50	1.44	2.46	4.10						
West.	6.00										
☉ ſets	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.59

Zen. Weſt.

A Sun-Dial for the Latitude of 1 Degree.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nort.		12	12	12	12	12	12	12	12	12	12
n *by* w		0.01	0.03	0.05	0.07	0.09	0.11	0.14	0.16	0.18	0.19
n n w		0.02	0.07	0.11	0.14	0.20	0.24	0.28	0.33	0.37	0.40
nw *bn*		0.04	0.11	0.17	0.24	0.31	0.38	0.46	0.53	1.00	1.05
n w		0.06	0.16	0.26	0.37	0.47	0.58	1.09	1.21	1.31	1.39
nw*bw*		0.09	0.24	0.40	0.56	1.12	1.29	1.51	2.06	2.23	2.37
w n w		0.15	0.39	1.05	1.35	2.00	2.32	3.09	3.53	5.00	
w *by* n		0.30	1.24	2.25	3.48						
West.	6.00										
⊙ set	6.00	6.00	6.00	6.00	6.01	6.01	6.01	6.01	6.01	6.02	6.02
Sun's Amp.	d. m 0.00	d. m 2.30	d. m 5.00	d. m 7.30	d. m 10.0	d. m 12.30	d. m 15.0	d. m 17.30	d. m 20.0	d. m 22.0	d. m 23.30

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
s s w	0.02	0.06	0.10	0.14	0.18	0.23	0.27	0.32	0.37	0.40	0.43
sw *by* s	0.03	0.09	0.16	0.23	0.30	0.37	0.44	0.51	0.59	1.05	1.10
s w	0.04	0.14	0.24	0.34	0.45	0.55	1.06	1.17	1.29	1.39	1.47
sw*bw*	0.06	0.21	0.36	0.52	1.08	1.12	1.41	1.59	2.18	2.35	2.49
w s w	0.10	0.34	0.58	1.24	1.51	2.19	2.51	3.28	4.16	5.19	
w *by* s	0.20	1.11	2.04	3.05	4.28						
West.	6.00										
⊙ sets	6.00	6.00	6.00	6.00	5.59	5.59	5.59	5.59	5.59	5.58	5.58

A Sun-Dial for the Latitude of 2 Degrees.

North Declination.

o d / o m	Deg. / Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	Nort.		12	12	12	12	12	12	12	12	12
0.02	n *by* w		0.02	0.04	0.07	0.09	0.11	0.13	0.15	0.17	0.18
0.03	n n w		0.05	0.09	0.13	0.18	0.22	0.27	0.32	0.36	0.38
0.05	nw *bn*		0.08	0.15	0.22	0.29	0.36	0.43	0.51	0.57	1.01
0.08	n w		0.12	0.22	0.33	0.43	0.54	1.05	1.17	1.27	1.35
0.12	nw*bw*		0.18	0.37	0.49	1.05	1.22	1.40	1.00	2.16	2.30
0.16	wn w		0.29	0.55	1.21	1.50	2.21	2.58	3.45	4.46	
0.40	w *by* n		1.03	2.03	3.23						
6.00	West.										
6.00	⊙ ſet	6.00	6.00	6.01	6.01	6.02	6.02	6.02	6.03	6.03	6.04
d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
0.00	Amp.	2.30	5.00	7.30	10.0	12.30	15.0	17.31	20.1	22.1	23.31

Zen. Weſt.

South Declination.

Deg. / Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22
s s w	0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.34	0.38	0.42	0.45
sw *by* s	0.05	0.12	0.19	0.25	0.32	0.39	0.46	0.54	1.01	1.08	1.11
s w	0.08	0.18	0.29	0.38	0.49	0.59	1.10	1.21	1.33	1.43	1.51
sw*bw*	0.12	0.27	0.42	0.57	1.13	1.29	1.46	2.04	2.23	2.40	2.54
w s w	0.16	0.43	1.08	1.33	2.00	2.28	3.00	3.36	4.24	5.24	
w *by* s	0.40	1.30	2.22	3.22	4.43						
West.	6.00										
⊙ ſets	6.00	6.00	6.00	5.59	5.59	5.58	5.58	5.58	5.57	5.57	5.54

A Sun-Dial for the Latitude of 3 Degrees.

North Declination.

○ d / ○ m / Deg. / Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
h m / Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	Nort.	12	12	12	12	12	12	12	12	12
0.02	n *by* w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18
0.05	n n w	0.03	0.07	0.12	0.16	0.21	0.25	0.30	0.34	0.37
0.08	nw *bn*	0.05	0.12	0.19	0.26	0.33	0.40	0.48	0.54	0.59
0.12	n w	0.08	0.19	0.29	0.35	0.50	1.01	1.13	1.23	1.31
0.18	nw*bw*	0.12	0.27	0.43	0.59	1.16	1.34	1.54	2.10	2.24
0.29	w n w	0.20	0.45	1.11	1.39	2.11	2.47	3.33	4.31	
0.59	w. *by* n	0.42	1.40	2.57						
6.00	Weſt.									
6.00	⊙ ſet	6.00	6.01	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.05
d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
0.00	Amp.	2.30	5.00	7.30	10.1	12.31	15.1	17.31	20.2	22.2	23.32

Zenith Weſt.

South Declination.

Deg. / Min. / ○ d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points / h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South 12	12	12	12	12	12	12	12	12	12	12
s *by* w 0.02	0.04	0.06	0.08	0.10	0.13	0.15	0.17	0.19	0.21	0.22
s s w 0.05	0.09	0.13	0.18	0.22	0.26	0.31	0.35	0.40	0.44	0.47
sw *by* s 0.08	0.15	0.21	0.28	0.35	0.42	0.49	0.56	1.04	1.10	1.15
s w 0.12	0.22	0.32	0.42	0.53	1.03	1.14	1.25	1.37	1.47	1.55
sw*bw* 0.18	0.33	0.48	1.03	1.19	1.35	1.52	2.10	2.30	2.46	3.00
w s w 0.29	0.53	1.17	1.42	2.09	2.37	3.08	3.43	4.31	5.29	
w *by* s 0.59	1.48	2.40	3.38	4.55						
Weſt. 6.00										
⊙ ſets 6.00	6.00	5.59	5.59	5.58	5.58	5.55	5.56	5.56	5.55	5.55

A Sun-Dial for the Latitude of 4 Degrees.

North Declination.

Deg.	2 d		5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m			30m		30m		30m			30m
Point	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	Nort.	12	12	12	12	12	12	12	12	12
s *by* w	0.01	n *by* w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17
s s w	0.02	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.28	0.32	0.35
sw *by* s	0.04	nw *bn*	0.03	0.09	0.16	0.23	0.30	0.38	0.45	0.52	0.57
s w	0.06	n w	0.04	0.14	0.21	0.35	0.46	0.57	1.09	1.19	1.27
sw *bw*	0.09	nw *bw*	0.05	0.21	0.37	0.53	1.10	1.28	1.47	2.04	2.17
w s w	0.14	w n w	0.10	0.35	1.01	1.29	2.00	2.36	3.21	4.17	
w *by* s	0.29	w *by* n	0.21	1.17	2.29						
West.	3.25										
⊙ set	6.00	⊙ set	6.01	6.02	6.03	6.03	6.04	6.05	6.06	6.06	6.07
Sun's	d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2.30	Amp.	5.00	7.31	10.1	12.31	15.2	17.32	20.3	22.3	23.34

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.03	0.05	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.23
s s w	0.07	0.11	0.15	0.19	0.23	0.28	0.32	0.36	0.41	0.45	0.48
sw *by* s	0.11	0.17	0.24	0.31	0.38	0.45	0.52	0.59	1.07	1.13	1.18
s w	0.16	0.26	0.36	0.46	0.57	1.07	1.18	1.29	1.41	1.51	1.59
sw *by* w	0.24	0.39	0.54	1.09	1.25	1.41	1.58	2.16	2.35	2.52	3.05
w s w	0.38	1.02	1.26	1.51	2.17	2.45	3.17	3.52	4.38	5.33	
w *by* s	1.17	2.05	2.55	3.51	5.03						
West.	6.00										
⊙ sets	6.00	6.00	5.59	5.58	5.57	5.57	5.54	5.55	5.54	5.54	5.53

A Sun-Dial for the Latitude of 5 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Point	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	Nort.		12	12	12	12	12	12	12	12
s *by* w	0.02	n *by* w		0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16
s s w	0.04	n n w		0.04	0.08	0.13	0.17	0.22	0.26	0.30	0.33
s w *b* s	0.07	n w *b* n		0.07	0.14	0.21	0.28	0.35	0.43	0.49	0.54
s w	0.10	n w		0.10	0.20	0.31	0.42	0.53	1.05	1.15	1.22
s w *b* w	0.19	n w *b* w		0.15	0.31	0.47	1.04	1.21	1.40	1.57	2.10
w s w	0.24	w n w		0.25	0.51	1.18	1.49	2.24	3.08	4.00	
w *by* s	0.48	w *by* n		0.54	2.01						
West	4.00										
⊙ ſet	6.01	⊙ ſet	6.02	6.03	6.04	6.04	6.05	6.06	6.07	6.08	6.09
Sun's	d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2.30	Amp.	5.01	7.31	10.2	12.32	15.3	17.34	20.5	22.5	23.26

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.04	0.05	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24
s s w	0.08	0.12	0.17	0.21	0.25	0.29	0.34	0.38	0.43	0.47	0.50
s w *b* s	0.13	0.20	0.27	0.33	0.40	0.47	0.54	1.02	1.09	1.16	1.21
s w	0.20	0.30	0.40	0.50	1.00	1.11	1.22	1.33	1.45	1.55	2.02
s w *by* w	0.30	0.45	1.00	1.15	1.34	1.46	2.03	2.21	2.40	2.56	3.11
w s w	0.48	1.11	1.35	2.00	2.26	2.53	3.24	3.59	4.43	5.35	
w *by* s	1.35	2.21	3.09	4.03	5.11						
West.	6.00										
⊙ ſets	6.00	5.59	5.58	5.57	5.56	5.56	5.55	5.54	5.53	5.52	5.51

A Sun-Dial for the Latitude of 6 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d		7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	Nort.	12	12	12	12	12	12	12	12
s *by* w	0.03	0.01	n *by* w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15
s s w	0.06	0.02	n n w	0.03	0.07	0.11	0.15	0.20	0.24	0.28	0.31
sw *by* s	0.09	0.03	nw *bn*	0.04	0.11	0.18	0.25	0.32	0.40	0.46	0.51
s w	0.14	0.04	n w	0.06	0.16	0.27	0.38	0.49	1.01	1.10	1.18
sw *bw*	0.21	0.06	nw *bw*	0.09	0.25	0.41	0.57	1.15	1.34	1.50	2.04
w s w	0.33	0.10	w n w	0.15	0.40	1.08	1.38	2.12	2.55	3.44	
w *by* s	1.06	0.20	w *by* n	0.32	1.34	3.24					
West.	4.22	2.15									
⊙ set	6.01	6.02	⊙ set	6.03	6.04	6.05	6.06	6.07	6.09	6.10	6.11
Sun's Amp.	d. m 2.30	d. m 5.01	Sun's Amp.	d. m 7.32	d. m 10.13	d. m 12.14	d. m 15.5	d. m 17.36	d. m 20.6	d. m 22.7	d. m 23.39

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.24
s s w	0.10	0.14	0.18	0.22	0.27	0.31	0.35	0.40	0.44	0.48	0.51
sw *by* s	0.16	0.23	0.29	0.36	0.43	0.50	0.57	1.04	1.12	1.18	1.23
s w	0.24	0.34	0.44	0.50	1.04	1.15	1.25	1.37	1.48	1.58	2.06
sw *by* w	0.36	0.50	1.05	1.20	1.36	1.52	2.08	2.26	2.45	3.02	3.15
w s w	0.57	1.20	1.44	2.08	2.34	3.01	3.31	4.06	4.48	5.37	
w *by* s	1.51	2.35	3.22	4.13	5.16						
West.	5.00										
⊙ sets	5.00	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49

A Sun-Dial for the Latitude of 7 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d		7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	Nort.	12	12	12	12	12	12	12	12
s *by* w	0.04	0.02	n *by* w	0.00	0.02	0.04	0.07	0.09	0.11	0.13	0.14
s s w	0.07	0.03	n n w	0.01	0.05	0.09	0.14	0.18	0.23	0.27	0.30
sw *b* s	0.12	0.05	nw *bn*	0.01	0.08	0.15	0.22	0.29	0.36	0.44	0.48
s w	0.18	0.08	n w	0.02	0.12	0.23	0.33	0.45	0.56	1.06	1.14
sw *b* w	0.27	0.12	nw *b* w	0.03	0.18	0.34	0.51	1.08	1.27	1.43	1.57
w s w	0.43	0.19	w n w	0,05	0.30	0.57	1.27	2.00	2.42	3.28	
w *by* s	1.23	0.39	w *by* n	0.10	1.08	2.36					
West	4.37	2.58									
⊙ set	6.01	6.02	⊙ set	6.03	6.05	6.06	6.08	6.09	6.10	6.11	6.12
Sun's	d. m	d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2.31	5.02	Amp.	7.33	10.4	12.35	15.7	17.38	20.9	22.10	23.42

South Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.24	0.25
s s w	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41	0.46	0.50	0.53
sw *b* s	0.19	0.25	0.32	0.39	0.45	0.52	0.59	1.07	1.13	1.21	1.25
s w	0.28	0.38	0.48	0.58	1.08	1.18	1.29	1.40	1.52	2.02	2.09
sw *by* w	0.41	0.56	1.11	1.26	1.41	1.57	2.14	2.31	2.50	3.06	3.19
w s w	1.06	1.29	1.52	2.16	2.41	3.08	3.38	4.12	4.53	5.39	
w *by* s	2.06	2.49	3.33	4.22	5.20						
West.	6.00										
⊙ sets	6.00	5.59	5.58	5.57	5.55	5.54	5.52	5.51	5.50	5.49	5.48

A Sun-Dial for the Latitude of 8 Degrees.

North Declination.

Deg.	2 d	5 d	7 d		10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m			30m		30m			30m
Point	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	Nort.	12	12	12	12	12	12	12
s *by* w	0.04	0.02	0.00	n *by* w	0.02	0.04	0.06	0.08	0.10	0.12	0.13
s s w	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.17	0.21	0.25	0.28
sw *bys*	0.15	0.08	0.01	nw *bn*	0.05	0.12	0.20	0.27	0.34	0.41	0.45
s w	0.22	0.12	0.02	n w	0.08	0.18	0.29	0.40	0.52	1.02	1.09
sw *bw*	0.33	0.18	0.03	nw *bw*	0.12	0.28	0.43	1.00	1.19	1.35	1.47
w s w	0.52	0.29	0.05	w n w	0.20	0.46	1.16	1.48	2.28	3.11	4.07
w *by* s	1.39	0.56	0.10	w *by* n	0.44	1.59					
West.	4.48	3.36	1.22								
⊙ ſet	6.01	6.03	6.04	⊙ ſet	6.06	6.07	6.09	6.10	6.12	6.13	6.14
Sun's	d. m	d. m	d. m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2.31	5.02	7.34	Amp.	10.6	12.37	15.9	17.10	20.12	22.13	23.46

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.25	0.26
s s w	0.13	0.17	0.21	0.26	0.30	0.34	0.38	0.43	0.47	0.51	0.54
sw *by* s	0.21	0.28	0.34	0.41	0.48	0.55	1.02	1.09	1.17	1.23	1.28
s w	0.32	0.41	0.51	1.01	1.11	1.22	1.33	1.44	1.55	2.05	2.13
sw *byw*	0.47	1.02	1.16	1.31	1.46	2.02	2.17	2.35	2.53	3.09	3.22
w s w	1.14	1.37	2.00	2.24	2.48	3.15	3.44	4.17	4.56	5.39	
w *by* s	2.20	3.01	3.44	4.26	5.24						
West.	6.00										
⊙ ſets	6.00	5.59	5.57	5.56	5.54	5.53	5.51	5.50	5.48	5.47	5.46

A Sun-Dial for the Latitude of 9 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m		10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	Nort.	12	12	12	12	12	12	12
s *by* w	0.05	0.03	0.01	n *by* w	0.01	0.03	0.05	0.07	0.09	0.11	0.12
s s w	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.26
sw *by* s	0.17	0.11	0.04	nw *by* n	0.03	0.10	0.17	0.24	0.31	0.38	0.43
s w	0.26	0.16	0.06	n w	0.04	0.14	0.25	0.36	0.47	0.57	1.05
sw *by* w	0.38	0.24	0.09	nw *by* w	0.06	0.22	0.38	0.55	1.14	1.30	1.42
w s w	1.00	0.38	0.14	w n w	0.10	0.36	1.04	1.36	2.15	2.55	3.42
w *by* s	1.53	1.13	0.29	w *by* n	0.21	1.27					
West	4.56	3.46	2.15								
⊙ set	6.01	6.03	6.04	⊙ set	6.06	6.08	6.10	6.12	6.14	6.15	6.16
Sun's Amp.	d. m 2.31	d. m 5.03	d. m 7.35	Sun's Amp.	d. m 10.7	d. m 12.39	d. m 15.11	d. m 17.43	d. m 20.16	d. m 22.1	d. m 23 50

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.24	0.25	0.27
s s w	0.15	0.19	0.23	0.27	0.31	0.36	0.40	0.44	0.49	0.54	0.56
sw *by* s	0.24	0.30	0.37	0.44	0.50	0.57	1.04	1.12	1.19	1.25	1.31
s w	0.36	0.45	0.55	1.05	1.15	1.26	1.36	1.47	1.59	2.09	2.16
sw *by* w	0.53	1.07	1.22	1.36	1.52	2.07	2.24	2.41	2.59	3.15	3.28
w s w	1.23	1.45	2.08	2.31	2.55	3.21	3.50	4.22	5.00	5.40	
w *by* s	2.33	3.12	3.53	4.36	5.27						
West.	6.00										
⊙ sets	6.00	5.59	5.57	5.55	5.54	5.52	5.50	5.48	5.46	5.45	5.44

A Sun-Dial for the Latitude of 10 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d		12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	Nort.	12	12	12	12	12	12
s *by* w	0.06	0.04	0.02		n *by* w	0.02	0.04	0.06	0.08	0.10	0.12
s s w	0.12	0.08	0.04		n n w	0.04	0.09	0.13	0.18	0.21	0.24
sw *by* s	0.20	0.13	0.07		nw *by* n	0.07	0.14	0.21	0.29	0.35	0.40
s w	0.30	0.17	0.10		n w	0.10	0.21	0.32	0.43	0.53	1.00
sw *by* w	0.44	0.30	0.15		nw *by* w	0.15	0.32	0.49	1.06	1.23	1.35
w s w	1.05	0.47	0.24		w n w	0.25	0.53	1.24	2.01	2.39	3.19
w *by* s	2.07	1.28	0.47		w *by* n	0.59	1.07				
West.	5.03	4.01	2.47								
⊙ ſet	6.02	6.04	6.05	6.07	⊙ ſet	6.09	6.11	6.13	6.15	6.17	6.18
Sun's Amp.	d. m 2.32	d. m 5.05	d. m 7.37	d. m 10.10	Sun's Amp.	d. m 12.42	d. m 15.15	d. m 17.47	d. m 20.26	d. m 22.22	d. m 23.54

Zenith Weſt.

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0 26	0.27
s s w	0.16	0.21	0.25	0.29	0.33	0.37	0.42	0.46	0.51	0.54	0.57
sw *by* s	0.26	0.33	0.40	0.46	0.53	1.00	1.07	1.14	1.22	1.28	1.33
s w	0.39	0.49	0.56	1.09	1.19	1.29	1.40	1.51	2.02	2.12	2.19
sw *by* w	0.58	1.13	1.27	1.42	1.57	2.12	2.28	2.45	3.03	3.19	3.32
w s w	1.31	1.53	2.15	2.38	3.02	3.27	3.55	4.26	5.03	5.41	
w *by* s	2.44	3.22	4.01	4.42	5.29						
West.	6.00										
⊙ ſets	6.00	5.58	5.56	5.55	5.53	5.51	5.49	5.47	5.45	5.43	5.42

A Sun-Dial for the Latitude of 11 *Degrees.*

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d		12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	Nort.	12	12	12	12	12	12
s *by* w	0.07	0.05	0.03	0.01	n *by* w	0.01	0.03	0.05	0.07	0.09	0.11
s s w	0.14	0.10	0.06	0.02	n n w	0.02	0.07	0.11	0.16	0.20	0.22
sw *by* s	0.21	0.16	0.11	0.03	nw *by* n	0.04	0.11	0.18	0.26	0.44	0.37
s w	0.34	0.24	0.14	0.04	n w	0.06	0.17	0.28	0.39	0.32	0.56
sw *by* w	0.50	0.35	0.21	0.06	nw *by* w	0.09	0.25	0.42	1.00	1.15	1.28
w s w	1.17	0.56	0.33	0.08	w n w	0.15	0.41	1.12	1.47	2.23	2.59
w *by* s	2.19	1.43	1.03	0.20	w *by* n	0.33	1.55				
West	5.08	4.13	3.09	2.19							
☉ ſet	6.02	6.04	6.06	6.08	☉ ſet	6.10	6.12	6.14	6.16	6.18	6.19
Sun's Amp.	d. m 2.32	d. m 5.05	d. m 7.38	d. m 10.11	Sun's Amp.	d. m 12.44	d. m 15.17	d. m 17.50	d. m 20.24	d. m 22.17	d. m 23.59

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w.	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.28
s s w	0.18	0.22	0.26	0.30	0.34	0.39	0.43	0.47	0.52	0.56	0.59
sw *by* s	0.29	0.37	0.42	0.49	0.55	1.02	1.09	1.16	1.24	1.30	1.35
s w	0.43	0.53	1.03	1.12	1.22	1.33	1.43	1.54	2.05	2.15	2.22
sw *by* w	1.04	1.18	1.32	1.47	2.01	2.17	2.33	2.49	3.07	3.23	3.39
w s w	1.39	2.01	2.22	2.45	3.10	3.33	4.00	4.30	5.05	5.41	
w *by* s	2.55	3.31	4.08	4.47	5.31						
West.	6.00										
☉ ſets	6.00	5.58	5.56	5.51	5.52	5.50	5.48	5.46	5.44	5.42	5.41

A Sun-Dial for the Latitude of 12 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d		12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	Nort.	12	12	12	12	12	12
* *by* w	0.07	0.06	0.04	0.02	n *by* w	0.00	0.02	0.04	0.07	0.09	0.10
s s w	0.16	0.12	0.08	0.04	n n w	0.01	0.05	0.10	0.14	0.18	0.21
sw *by* s	0.25	0.19	0.12	0.05	nw *bn*	0.01	0.08	0.15	0.23	0.29	0.34
s w	0.37	0.28	0.18	0.08	n w	0.02	0.12	0.23	0.35	0.44	0.51
sw *bw*	0.55	0.41	0.27	0.12	nw*bw*	0.03	0.19	0.33	0.49	1.09	1.21
w s w	1.25	1.04	0.42	0.19	w n w	0.05	0.31	1.00	1.14	2.07	2.40
w *by* s	2.31	1.56	1.23	0.38	w *by* n	0.09	1.17				
West.	5.13	4.23	3.27	2.16							
⊙ set	6.02	6.04	6.06	6.09	⊙ set	6.11	6.13	6.15	6.18	6.20	6.22
Sun's	d. m	d. m	d. m	d m	Sun's	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2.33	5.07	7.39	10.13	Amp.	11.46	15.10	17.55	20.28	22.31	24.5

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
s s w	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.49	0.53	0.57	1.00
sw *by* s	0.32	0.38	0.45	0.51	0.58	1.05	1.12	1.19	1.26	1.32	1.37
s w	0.47	0.56	1.06	1.16	1.26	1.36	1.46	1.57	2.08	2.18	2.25
sw*by*w	1.09	1.23	1.37	1.52	2.06	2.21	2.37	2.51	3.11	3.27	3.39
w s w	1.47	2.07	2.29	2.51	3.14	3.38	4.04	4.33	5.07	5.41	
w *by* s	3.05	3.39	4.18	4.51	5.32						
West.	5.00										
⊙ sets	5.00	5.58	5.56	5.54	5.51	5.49	5.47	5.45	5.42	5.40	5.38

A Sun-Dial for the Latitude of 13 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d		15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	Nort.	12	12	12	12	12
s *by* w	0.18	0.06	0.04	0.02	0.00	n *by* w	0.02	0.04	0.06	0.08	0.09
s s w	0.17	0.13	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.16	0.15
sw *b* s	0.28	0.21	0.15	0.08	0.01	nw *bn*	0.06	0.13	0.21	0.27	0.31
s w	0.41	0.32	0.22	0.12	0.02	n w	0.08	0.17	0.30	0.40	0.47
sw*b*w	1.01	0.47	0.32	0.18	0.03	nw*b*w	0.13	0.29	0.46	1.01	1.13
w s w	1.33	1.12	0.51	0.28	0.05	wn w	0.21	0.49	1.21	1.52	2.22
w *by* s	2.41	2.08	1.29	0.54	0.10	w *by* n	0.48				
West	5.16	4.31	3.39	2.41	1.05						
⊙ set	6.02	6.05	6.07	6.09	6.11	⊙ set	6.14	6.16	6.19	6.21	6.23
Sun's Amp.	d. m 2.33	d. m 5.08	d. m 7.42	d. m 10.16	d. m 12.45	Sun's Amp.	d. m 15.24	d. m 17.59	d. m 20.33	d. m 22.37	d. m 24.11

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.29
s s w	0.21	0.25	0.29	0.33	0.38	0.42	0.46	0.50	0.55	0.59	1.02
s w *b* s	0.34	0.41	0.47	0.54	1.00	1.07	1.14	1.20	1.28	1.34	1.39
s w	0.51	1.00	1.10	1.19	1.29	1.39	1.50	2.01	2.12	2.21	2.29
sw*by*w	1.14	1.28	1.42	1.56	2.11	2.26	2.41	2.58	3.15	3.30	3.42
w s w	1.54	2.15	2.36	2.57	3.20	3.43	4.09	4.37	5.09	5.40	
w *by* s	3.14	3.47	4.20	4.55	5.34						
West.	6.00										
⊙ sets	6.00	5.58	5.55	5.53	5.51	5.49	5.46	5.44	5.41	5.39	5.37

A Sun-Dial for the Latitude of 14 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m		15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	Nort.	12	12	12	12	12
s *by* w	0.09	0.07	0.05	0.03	0.01	n *by* w	0.01	0.03	0.05	0.07	0.08
s s w	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.17
sw *by* s	0.30	0.24	0.17	0.11	0.04	nw *b* n	0.03	0.10	0.17	0.22	0.28
s w	0.45	0.35	0.26	0.16	0.06	n w	0.04	0.15	0.26	0.35	0.43
sw *bw*	1.06	0.52	0.38	0.24	0.09	nw *bw*	0.06	0.22	0.40	0.54	1.06
w s w	1.41	1.20	0.59	0.38	0.15	w n w	0.10	0.37	1.08	1.38	2.05
w *by* s	2.52	2.19	1.46	1.10	0.29	w *by* n	0.22	1.48			
West.	4.20	5.38	3.52	3.00	1.49						
⊙ set	6.02	6.05	6.07	6.10	6.12	⊙ set	6.15	6.18	6.21	6.23	6.25
Sun's Amp.	d. m 2.34	d. m 5.09	d. m 7.44	d m 10.19	d. m 12.53	Sun's Amp.	d. m 15.28	d. m 18.3	d. m 20.38	d. m 22.43	d. m 24.17

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.30
s s w	0.23	0.27	0.31	0.35	0.40	0.44	0.48	0.53	0.57	1.01	1.04
sw *by* s	0.37	0.43	0.50	0.56	1.03	1.10	1.16	1.23	1.31	1.36	1.42
s w	0.54	1.04	1.13	1.23	1.33	1.43	1.53	2.04	2.15	2.24	2.31
sw *by* w	1.20	1.33	1.47	2.01	2.15	2.30	2.45	3.02	3.19	3.33	3.45
w s w	2.01	2.21	2.42	3.03	3.25	3.48	4.12	4.40	5.11	5.40	
w *by* s	3.22	3.53	4.25	4.59	5.35						
West.	5.00										
⊙ sets	5.00	5.58	5.55	5.53	5.50	5.48	5.45	5.42	5.39	5.37	5.35

A Sun-Dial for the Latitude of 15 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m		15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	Nort.	12	12	12	12	12
s *by* w	0.10	0.08	0.06	0.04	0.02	n *by* w		0.02	0.04	0.06	0.07
s s w	0.21	0.16	0.12	0.08	0.04	n n w		0.04	0.09	0.12	0.15
sw *b* s	0.33	0.26	0.20	0.13	0.07	nw *bn*		0.07	0.14	0.20	0.25
s w	0.49	0.39	0.30	0.20	0.10	n w		0.11	0.22	0.31	0.38
sw *b* w	1.11	0.58	0.44	0.30	0.15	nw *bw*		0.16	0.33	0.47	0.59
w s w	1.40	1.28	1.08	0.47	0.24	w n w		0.26	0.56	1.24	1.50
w *by* s	3.00	2.30	1.58	1.24	0.46	w *by* n		1.06			
West	5.22	4.44	4.02	3.15	2.17						
☉ set	6.02	6.05	6.08	6.11	6.13	☉ set	6.16	6.19	6.22	6.25	6.27
Sun's	d. m	d. m	d. m	d. m	d. m	Sun's	d. m	d. m	d. m	d. m	d. m
Amp.	2.35	5.10	7.46	10.21	12.50	Amp.	15.32	18.8	20.44	22.49	24.24

Zen.

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.31
s s w	0.24	0.28	0.32	0.36	0.40	0.45	0.49	0.53	0.58	1.01	1.04
s w *b* s	0.39	0.46	0.52	0.59	1.05	1.12	1.18	1.25	1.33	1.39	1.43
s w	0.58	1.07	1.17	1.26	1.36	1.46	1.56	2.07	2.18	2.27	2.34
sw *by* w	1.25	1.38	1.52	2.06	2.20	2.34	2.49	3.05	3.22	3.37	3.48
w s w	2.08	2.28	2.48	3.08	3.29	3.52	4.16	4.42	5.12	5.40	
w *by* s	3.30	4.00	4.30	5.02	5.36						
West.	6.00										
☉ sets	6.00	5.58	5.55	5.52	5.49	5.47	5.44	5.41	5.38	5.35	5.33

A Sun-Dial for the Latitude of 16 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d		17 d	20 d	22 d	23 d
Min.	30m		30m		30m			30m			30m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	Nort.	12	12	12	12
s *by* w	0.11	0.09	0.07	0.05	0.03	0.01	n *by* w	0.01	0.03	0.05	0.07
s s w	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.03	0.07	0.11	0.14
sw *by* s	0.35	0.29	0.23	0.16	0.10	0.03	nw *bn*	0.04	0.09	0.17	0.22
s w	0.52	0.43	0.34	0.25	0.14	0.04	n w	0.06	0.17	0.26	0.33
sw *bw*	1.16	0.03	0.49	0.35	0.21	0.06	n *vbw*	0.10	0.26	0.40	0.52
w s w	1.55	1.36	1.16	0.55	0.33	0.10	wn w	0.16	0.14	1.11	1.34
w *by* s	3.08	2.39	2.09	1.37	1.01	0.20	w *by* n	0.36			
West.	5.25	4.49	4.11	3.28	2.37	1.23					
⊙ set	6.03	6.06	6.09	6.12	6.15	6.18	⊙ set	6.21	6.24	6.27	6.29
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	Sun's	d. m	d. m	d. m	d. m
Amp.	2.35	5.12	7.48	10.24	13.0	15 37	Amp.	18.13	20.51	22.56	24.32

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.13	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32
s s w	0.26	0.30	0.34	0.38	0.42	0.46	0.50	0.55	0.59	1.03	1.06
sw *by* s	0.42	0.48	0.54	1.01	1.07	1.14	1.21	1.28	1.35	1.41	1.46
s w	1.02	1.11	1.20	1.29	1.39	1.49	1.59	2.10	2.21	2.30	2.37
sw *byw*	1.30	1.43	1.56	2.10	2.24	2.38	2.53	3.09	3.25	3.40	3.51
w s w	2.15	2.34	2.54	3.14	3.34	3.56	4.19	4.45	5.13	5.40	
w *by* s	3.37	4.05	4.34	5.04	5.36						
West.	6.00										
⊙ sets	6.00	5.57	5.54	5.51	5.48	5.45	5.42	5.39	5.36	5.33	5.31

A Sun-Dial for the Latitude of 17 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d		17 d 30m	20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	Nort.	12	12	12	12
s *by* w	0.11	0.09	0.07	0.06	0.04	0.02	n *by* w	0.00	0.02	0.04	0.06
s s w	0.24	0.20	0.16	0.12	0.08	0.03	n n w	0.01	0.05	0.09	0.12
sw *by* s	0.38	0.32	0.25	0.19	0.13	0.06	nw *by* n	0.01	0.08	0.15	0.19
s w	0.56	0.47	0.38	0.28	0.19	0.08	n w	0.02	0.13	0.22	0.29
sw *by* w	1.21	1.08	0.55	0.41	0.27	0.12	nw *by* w	0.03	0.19	0.33	0.45
w s w	2.02	1.43	1.23	1.03	0.42	0.19	w n w	0.05	0.33	0.58	1.20
w *by* s	3.16	2.48	2.20	1.49	1.16	0.37	w *by* n	0.11	1.36		
West	5.27	4.53	4.18	3.39	2.54	1.55					
w *by* n					5.50	5.11					
⊙ set	6.03	6.06	6.09	6.12	6.15	6.19	⊙ set	6.22	6.25	6.28	6.31
Sun's Amp.	d. m 2.36	d. m 5.13	d. m 7.50	d. m 10.28	d. m 13.37	d. m 15.42	Sun's Amp.	d. m 18.19	d. m 20.57	d. m 23.4	d. m 24.40

South Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12
s *by* w	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33
s s w	0.28	0.32	0.36	0.39	0.43	0.47	0.52	0.56	1.01	1.04	1.07
sw *by* s	0.44	0.50	0.57	1.03	1.09	1.16	1.23	1.30	1.37	1.43	1.47
s w	1.05	1.14	1.24	1.33	1.42	1.51	2.06	2.13	2.23	2.32	2.39
sw *by* w	1.35	1.48	2.01	2.14	2.28	2.42	2.57	3.12	3.29	3.42	3.54
w s w	2.21	2.40	2.59	3.18	3.39	4.00	4.22	4.47	5.14	5.39	
w *by* s	3.43	4.10	4.38	5.07	5.37						
West.	6.00										
⊙ sets	6.00	5.57	5.54	5.51	5.48	5.45	5.41	5.38	5.35	5.32	5.29

A Sun-Dial for the Latitude of 18 Degrees.

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m		20 d	22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	Nort.	12	12	12
s *by* w	0.12	0.10	0.08	0.06	0.04	0.02	0.00	n *by* w	0.02	0.03	0.05
s s w	0.25	0.21	0.17	0.13	0.09	0.05	0.01	n n w	0.04	0.07	0.10
sw *by* s	0.40	0.34	0.28	0.21	0.15	0.09	0.01	nw *by* n	0.06	0.12	0.16
s w	1.00	0.50	0.41	0.32	0.22	0.12	0.02	n w	0.09	0.17	0.24
sw *by* w	1.26	1.13	1.00	0.47	0.34	0.18	0.03	n w *by* w	0.13	0.27	0.38
w s w	2.08	1.50	1.31	1.11	0.51	0.29	0.05	w n w	0.21	0.45	1.06
w *by* s	3.23	2.57	2.29	2.00	1.29	0.53	0.10	w *by* n	0.53		
West.	5.29	4.57	4.24	3.49	3.08	2.18	0.56				
w *by* n					5.51	5.15	4.32				
⊙ set	6.02	6.06	6.09	6.13	6.16	6.20	6.23	⊙ set	6.27	6.30	6.33
Sun's Amp.	d. m 2.37	d. m 5.15	d. m 7.53	d. m 10.31	d. m 13.9	d. m 15.47	d. m 18.26	Sun's Amp.	d. m 21.4	d. m 23.12	d. m 24.48

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.33
s s w	0.29	0.33	0.37	0.41	0.45	0.49	0.53	0.58	1.02	1.06	1.08
sw *by* s	0.47	0.53	0.59	1.05	1.12	1.18	1.25	1.32	1.39	1.45	1.50
s w	1.09	1.18	1.27	1.36	1.46	1.55	2.05	2.15	2.26	2.35	2.42
s w *by* w	1.39	1.52	2.05	2.18	2.32	2.44	3.00	3.15	3.31	3.45	3.55
w s w	2.27	2.45	3.04	3.23	3.43	4.03	4.25	4.49	5.15	5.39	
w *by* s	3.49	4.15	4.41	5.09	5.38						
West.	6.00										
⊙ sets	6.00	5.58	5.54	5.51	5.47	5.44	5.40	5.37	5.33	5.30	5.27

A Sun-Dial for the Latitude of 19 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	Nort.	12	12	12
s *by* w	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n *by* w	0.01	0.03	0.04
s s w	0.27	0.23	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.05	0.08
sw *by* s	0.43	0.37	0.30	0.24	0.18	0.11	0.05	nw *bn*	0.03	0.09	0.13
s w	1.03	0.54	0.45	0.36	0.27	0.17	0.07	n w	0.04	0.13	0.20
sw *bw*	1.35	1.18	1.05	0.52	0.38	0.24	0.09	nw *bw*	0.06	0.20	0.31
w s w	2.15	1.57	1.38	1.19	0.59	0.41	0.15	w n w	0.10	0.33	0.53
w *by* s	3.29	3.04	2.38	2.09	1.41	1.08	0.29	w *by* n	0.23		
West	5.31	5.01	4.30	3.57	3.20	2.36	1.35				
w *by* n					5.52	5.17	4.40				
⊙ set	6.03	6.07	6.10	6.14	6.17	6.21	6.24	⊙ set	6.28	6.31	6.34
Sun's Amp.	d. m 2.38	d. m 5.17	d. m 7.56	d. m 10.35	d. m 13.14	d. m 15.53	d. m 18.33	Sun's Amp.	d. m 21.12	d. m 23.20	d. m 24.58

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.32	0.34
s s w	0.31	0.35	0.38	0.42	0.46	0.50	0.54	0.58	1.03	1.07	1.09
sw *by* s	0.49	0.55	1.01	1.08	1.14	1.21	1.27	1.33	1.41	1.47	1.51
s w	1.12	1.21	1.30	1.39	1.48	1.58	2.07	2.16	2.29	2.37	2.44
sw *bw*	1.40	1.57	2.06	2.23	2.36	2.49	3.04	3.19	3.34	3.48	3.58
w s w	2.33	2.51	3.09	3.27	3.46	4.06	4.25	4.51	5.16	5.39	
w *by* s	4.54	4.19	4.44	5.10	5.39						
West	6.00										
⊙ set	6.00	5.57	5.53	5.50	5.46	5.43	5.39	5.36	5.32	5.29	5.26

A Sun-Dial for the Latitude of 20 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d		20 d	22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	Nort.	12	12	12
s *by* w	0.14	0.12	0.10	0.08	0.06	0.04	0.02	n *by* w		0.02	0.03
s s w	0.28	0.25	0.21	0.17	0.13	0.09	0.05	n n w		0.04	0.06
sw *by* s	0.45	0.39	0.33	0.23	0.20	0.14	0.07	nw *by* n		0.06	0.10
s w	1.07	0.58	0.49	0.40	0.30	0.21	0.11	n w		0.09	0.16
sw *by* w	1.36	1.23	1.10	0.58	0.44	0.30	0.15	nw *by* w		0.13	0.24
w s w	2.21	2.03	1.45	1.26	1.07	0.46	0.24	w n w		0.22	0.40
w *by* s	3.37	3.11	2.45	2.20	1.52	1.21	0.45	w *by* n			
West.	5.32	5.04	4.35	4.00	3.30	2.50	2.00				
w *by* n					5.54	5.23	4.47				
⊙ set	6.03	6.07	6.11	6.15	6.18	6.22	6.26	⊙ set	6.30	6.33	6.36
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	Sun's	d. m	d. m	d. m
Amp.	2.40	5.20	7.59	10.39	13.19	16.0	18.1	Amp.	21.20	23.29	25.8

Zen.

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.16	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.33
s s w	0.32	0.36	0.40	0.44	0.48	0.52	0.56	1.00	1.05	1.08	1.11
sw *by* s	0.51	0.58	1.04	1.10	1.12	1.23	1.29	1.36	1.43	1.49	1.53
s w	1.16	1.24	1.33	1.42	1.51	2.01	2.10	2.20	2.31	2.40	2.47
sw *by* w	1.48	2.01	2.14	2.26	2.39	2.53	3.07	3.25	3.37	3.50	4.00
w s w	2.38	2.56	3.13	3.31	3.50	4.09	4.30	4.52	5.16	5.38	
w *by* s	3.59	4.23	4.47	5.12	5.38						
West.	6.00										
⊙ sets	6.00	5.57	5.53	5.49	5.45	5.42	5.38	5.34	5.30	5.27	5.24

A Sun-Dial for the Latitude of 21 *Degrees.*

North Declination.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d		22 d	23 d 30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	Nort.	12	12
s *by* w	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n *by* w	0.01	0.02
s s w	0.30	0.26	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.02	0.04
sw *by* s	0.48	0.42	0.35	0.29	0.23	0.16	0.10	0.03	nw *b* n	0.03	0.07
s w	1.10	1.01	0.52	0.43	0.34	0.26	0.15	0.04	n w	0.04	0.11
sw *bw*	1.40	1.27	1.16	1.03	0.49	0.36	0.21	0.06	nw *bw*	0.06	0.17
w s w	2.26	2.05	1.52	1.29	1.15	0.55	0.33	0.10	w n w	0.11	0.40
w *by* s	3.41	3.18	2.54	2.29	2.03	1.33	1.00	0.20	w *by* n	0.24	
West	5.34	5.07	4.40	4.11	3.39	3.03	2.19	4.14			
w *by* n					5.55	5.26	4.53	4.12			
⊙ set	6.04	6.08	6.12	6.16	6.20	6.25	6.28	6.32	⊙ set	6.35	6.38
Sun's Amp.	d. m 2.41	d. m 5.21	d. m 8.02	d. m 10.43	d. m 13.24	d. m 16.6	d. m 18.47	d. m 21.25	Sun's Amp.	d. m 23.40	d. m 25.18

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35
s s w	0.34	0.38	0.42	0.45	0.49	0.54	0.58	1.02	1.06	1.10	1.11
sw *by* s	0.54	1.00	1.06	1.12	1.19	1.25	1.32	1.38	1.45	1.51	1.55
s w	1.19	1.28	1.37	1.46	1.55	2.04	2.13	2.23	2.33	2.42	2.49
sw *by* w	1.53	2.05	2.18	2.30	2.43	2.56	3.10	3.24	3.39	3.52	4.02
w s w	2.43	3.01	3.18	3.35	3.54	4.12	4.32	4.53	5.17		
w *by* s	4.04	4.27	4.50	5.14	5.39						
West.	6.00										
⊙ sets	6.00	5.56	5.52	5.48	5.44	5.40	5.35	5.32	5.28	5.25	5.22

A Sun-Dial for the Latitude of 22 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d		22 d	23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	Nort.	12	12
s *by* w	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	n *by* w	Zen.	0.01
s s w	0.31	0.28	0.24	0.20	0.16	0.12	0.08	0.04	n n w		0.03
sw *bys*	0.50	0.44	0.42	0.32	0.25	0.19	0.13	0.06	nw *bn*		0.04
s w	1.14	1.05	0.56	0.47	0.38	0.29	0.19	0.08	n w		0.07
sw *bw*	1.45	1.33	1.20	1.08	0.55	0.41	0.27	0.13	nw *bw*		0.10
w s w	2.30	2.15	1.58	1.40	1.22	1.03	0.42	0.20	w n w		0.17
w *by* s	3.46	3.24	3.01	2.39	2.12	1.45	1.14	0.37			
West.	5.35	5.10	4.44	4.17	3.47	3.14	2.35	1.43			
w *by* n					5.56	5.28	4.58	4.21			
⊙ set	6.04	6.08	6.12	6.16	6.20	6.25	6.29	6.34	⊙ set	6.37	6.40
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	Sun's	d. m	d. m
Amp.	2.42	5.23	8.05	10.4	13.30	16.13	18.55	21.39	Amp.	23.50	25.29

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.17	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.35
s s w	0.35	0.39	0.43	0.47	0.51	0.55	0.59	1.03	1.07	1.11	1.13
sw *by* s	0.56	1.02	1.08	1.14	1.21	1.27	1.33	1.40	1.47	1.52	1.57
s w	1.22	1.31	1.40	1.49	1.58	2.07	2.16	2.25	2.36	2.44	2.51
sw *by* w	1.57	2.09	2.21	2.34	2.46	2.59	3.13	3.27	3.42	3.54	4.04
w s w	3.49	3.05	3.22	3.39	3.57	4.15	4.34	4.55	5.17		
w *by* s	4.08	4.30	4.52	5.15	5.39						
West.	6.00										
⊙ sets	6.00	5.50	5.52	5.48	5.44	5.40	5.35	5.31	5.26	5.23	5.20

A Sun-Dial for the Latitude of 23 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d		23 d
Min.	30m		30m		30m		30m				30m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m
South	12	12	12	12	12	12	12	12	12	Nort.	12
s *by* w	0.16	0.15	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n *by* w	0.00
s s w	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.05	0.02	n n w	0.01
sw *by* s	0.53	0.47	0.41	0.34	0.28	0.22	0.16	0.09	0.03	nw *by* n	0.01
s w	1.17	1.08	1.00	0.50	0.41	0.32	0.22	0.13	0.04	n w	0.02
sw *by* w	1.49	1.37	1.25	1.13	1.00	0.47	0.33	0.19	0.06	nw *by* w	0.03
w s w	2.37	2.21	2.04	1.47	1.29	1.11	0.51	0.29	0.10	w n w	0.06
w *by* s	3.51	3.30	3.08	2.45	2.21	1.55	1.26	0.59	0.20		
West	5.36	5.12	4.48	4.22	3.54	3.23	2.48	2.04	1.11		
w *by* n				5.21	5.57	5.31	5.02	4.29	3.56		
⊙ set	6.04	6.09	6.13	6.17	6.22	6.26	6.31	6.36	6.39	⊙ set	6.43
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	Sun's	d. m
Amp.	2.43	5.26	8.10	10.52	13.36	16.23	19.4	21.49	23.11	Amp.	23.41

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35	0.36
s s w	0.37	0.41	0.44	0.48	0.51	0.55	0.59	1.03	1.08	1.12	1.15
sw *by* s	0.59	1.04	1.10	1.16	1.23	1.29	1.35	1.41	1.49	1.54	1.59
s w	1.25	1.34	1.43	1.51	2.00	2.10	2.19	2.28	2.39	2.46	2.53
sw *by* w	2.01	2.13	2.25	2.37	2.50	3.02	3.16	3.29	3.44	3.56	4.06
w s w	2.53	3.10	3.26	3.43	4.00	4.17	4.36	4.56	5.17		
w *by* s	4.12	4.33	4.54	5.16	5.39						
West.	6.00										
⊙ sets	6.00	5.56	5.51	5.47	5.43	5.38	5.34	5.29	5.24	5.21	5.17

A Sun-Dial for the Latitude of 24 Degrees.

North Declination.

Deg.	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.	30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12
s *by* w	0,17	0,15	0,13	0,11	0,09	0,08	0,06	0,04	0,02	0,00
s s w	0,35	0,35	0,27	0,23	0,19	0,15	0,11	0,07	0,04	0,01
sw *by* s	0,55	0,49	0,43	0,37	0,30	0,24	0,18	0,11	0,06	0,01
s w	1,20	1,12	1,03	0,53	0,44	0,35	0,25	0,17	0,09	0,02
sw *by* w	1,54	1,42	1,30	1,18	1,05	0,52	0,39	0,21	0,13	0,03
w s w	2,42	2,26	2,10	1,53	1,36	1,18	0,59	0,38	0,20	0,05
w *by* s	3,56	3,35	3,14	2,52	2,29	2,05	1,34	1,07	0,33	0,10
West.	5,37	5,15	4,51	4,27	4,01	3,32	3,00	2,21	1,39	0,49
w *by* n				6,21	5,58	5,33	5,06	4,35	4,06	3,39
w n w									6,24	5,09
⊙ sets	6,04	6,09	6,13	6,18	6,23	6,27	6,32	6,37	6,41	6,45
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	2,44	5,28	8,13	10,57	13.42	16.27	19.13	21.50	24.1	25.14

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,18	0,20	0,22	0,24	0,26	0,28	0,29	0,31	0,33	0,35	0,37
s s w	0,38	0,42	0,46	0,50	0,53	0,57	1,01	1,05	1,10	1,13	1,16
sw *by* s	1,01	1,07	1,13	1,19	1,25	1,31	1,37	1,44	1,50	1,56	2,00
s w	1,29	1,37	1,46	1,54	2,04	2,13	2,23	2,32	2,40	2,49	2,55
sw *by* w	2,05	2,17	2,29	2,41	2,53	3,05	3,18	3,32	3,46	3,58	4,08
w s w	2,58	3,14	3,30	3,46	4,02	4,20	4,38	4,57	5,18		
w *by* s	4,16	4,36	4,56	5,17	5,39						
West.	6,00										
⊙ sets	6,00	5,56	5,51	5,47	5,42	5,37	5,33	5,28	5,23	5,19	5,15

A Sun-Dial for the Latitude of 25 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,19	0,17	0,16	0,14	0,12	0,10	0,08	0,06	0,04	0,02	0,01
s s w	0,40	0,36	0,32	0,29	0,25	0,21	0,17	0,13	0,09	0,05	0,03
sw *by* s	1,03	0,57	0,51	0,45	0,39	0,33	0,27	0,21	0,14	0,09	0,04
s w	1,32	1,23	1,15	1,06	0,57	0,49	0,40	0,31	0,21	0,13	0,06
sw *by* w	2,09	1,58	1,46	1,35	1,22	1,10	0,58	0,44	0,31	0,19	0,10
w s w	3,02	2,47	2,32	2,16	2,00	1,43	1,25	1,07	0,47	0,29	0,15
w *by* s	4,19	4,00	3,40	3,20	2,59	2,37	2,14	1,48	1,19	0,53	0,29
West.	6,00	5,38	5,17	4,54	4,31	4,06	3,40	3,10	2,39	2,00	1,24
w *by* n					6,21	5,59	5,36	5,10	4,41	4,14	3,50
w n w										6,25	6,10
⊙ sets	6,00	6,05	6,09	6,14	6,19	6,24	6,29	6,34	6,36	6,43	6,47
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	2,45	5,31	8.16	11.2	[illegible]	16.25	19.22	22.10	24.[illegible]	26.7

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,19	0,21	0,23	0,25	0,27	0,28	0,30	0,32	0,34	0,36	0,38
s s w	0,40	0,43	0,47	0,51	0,55	0,59	1,02	1,06	1,11	1,14	1,17
sw *by* s	1,03	1,09	1,15	1,21	1,27	1,33	1,39	1,46	1,52	1,58	2,02
s w	1,32	1,40	1,48	1,57	2,06	2,14	2,23	2,33	2,42	2,50	2,57
sw *by* w	2,09	2,21	2,32	2,44	2,56	3,08	3,21	3,34	3,48	4,00	4.09
w s w	3,02	3,18	3,33	3,49	4,05	4,22	4,39	4,58	5,19		
w *by* s	4,19	4,39	4,58	5,18	5,39						
West.	6,00										
⊙ sets	6,00	5,55	6,51	5,46	5,41	5,25	5,31	5,26	5,21	5,17	5,13

A Sun-Dial for the Latitude of 26 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,20	0,18	0,16	0,14	0,13	0,11	0,09	0,07	0,05	0,03	0,02
s s w	0,41	0,38	0,34	0,30	0,26	0,23	0,19	0,15	0,11	0,07	0,04
sw *by* s	1,05	0,59	0,54	0,48	0,42	0,36	0,30	0,24	0,17	0,11	0,07
s w	1,35	1,26	1,18	1,10	1,01	0,52	0,43	0,34	0,25	0,17	0,11
sw *by* w	2,13	2,02	1,50	1,39	1,27	1,15	1,03	0,50	0,36	0,25	0,16
w s w	3,07	2,52	2,37	2,21	2,06	1,49	1,32	1,14	0,55	0,38	0,25
w *by* s	4,22	4,04	3,45	3,25	3,06	2,45	2,18	1,58	1,31	1,07	0,45
West.	6,00	5,39	5,19	4,57	4,35	4,12	3 47	3,19	2,47	2,16	1,47
w *by* n					6,21	6,00	5,38	5,13	4,46	4,22	4,00
w n w									6,42	6,25	6,12
⊙ sets	6,00	6,05	6,10	6,15	6,20	6,25	6,30	6,35	6,41	6,45	6,49
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	2,46	5,34	8,20	11,8	12,56	16,44	19,35	22,22	42,28	26,22

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,20	0,22	0,24	0,25	0,27	0,29	0,31	0,33	0,35	0,36	0,38
s s w	0,41	0,45	0,49	0,52	0,56	1,00	1,04	1,08	1,12	1,15	1,18
sw *by* s	1,05	1,11	1,17	1,23	1,29	1,35	1,41	1,47	1,54	1,59	2,03
s w	1,35	1,43	1,51	2,00	2,08	2,17	2,26	2,35	2,44	2,52	2,59
sw *by* w	2,13	2,24	2,36	2,47	2,59	3,11	3,23	3,36	3,50	4,01	4,10
w s w	3,07	3,21	3,37	3,52	4,07	4,24	4,41	4,59	5,18		
w *by* s	4,22	4,41	5,00	5,19							
West.	6,00										
⊙ sets	6,00	5,55	5,50	5,45	5,40	5,35	5,30	5,25	5,19	5,15	5,11

A Sun-Dial for the Latitude of 27 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,21	0,19	0,17	0,15	0,13	0,12	0,10	0,08	0,06	0,04	0,03
s s w	0,43	0,39	0,35	0,32	0,28	0,24	0,20	0,17	0,12	0,09	0,06
sw *by* s	1,07	1,02	0,56	0,50	0,45	0,39	0,33	0,27	0,20	0,13	0,10
s w	1,38	1,30	1,21	1,13	1,05	0,56	0,47	0,38	0,29	0,21	0,15
sw*by*w	2,17	2,06	1,55	1,43	1,32	1,20	1,08	0,55	0,42	0,32	0,23
w s w	3,10	2,56	2,41	2,26	2,11	1,55	1,39	1,22	1,03	0,47	0,34
w *by* s	4,25	4,07	3,49	3,31	3,11	2,51	2,30	2,07	1,42	1,19	0,59
West.	6,00	5,40	5,21	5,00	4,39	4,17	3,53	3,27	2,58	2,30	2,05
w *by* n					6,21	6,01	5,39	5,17	4,51	4,28	4,09
w n w									6,42	6,26	6,13
⊙ sets	6,00	6,05	6,10	6,15	6,21	6,26	6,31	6,37	6,43	6,48	6,51
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	2,48	5,36	8.25	11.14	14,3	16.53	19 43	22.22	24.52	26.37

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,21	0,22	0,24	0,26	0,28	0,30	0,32	0,34	0,36	0,37	0,38
s s w	0,43	0,46	0,50	0,53	0,57	1,01	1,05	1,09	1,13	1,16	1,19
sw *by* s	1,07	1,13	1,19	1,25	1,30	1,36	1,42	1,48	1,55	2,02	2,05
s w	1,38	1,46	1,54	2,02	2,11	2,19	2,28	2,37	2,46	2,54	3,00
sw*by*w	2,17	2,28	2,39	2,50	3,02	3,13	3,26	3,38	3,52	4,01	4,10
w s w	3,10	3,25	3,40	3,54	4,10	4,25	4,42	4,59	5,18		
w *by* s	4,25	4,43	5,02	5,20	5,39						
West	6,00										
⊙ sets	6,00	5,55	5,50	5,45	5,39	5,34	5,29	5,23	5,17	5,12	5,09

A Sun-Dial for the Latitude of 28 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.21	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.04
s s w	0.44	0.40	0.37	0.33	0.30	0.26	0.22	0.18	0.14	0.11	0.08
sw *by* s	1.10	1.04	0.58	0.53	0.47	0.41	0.35	0.29	0.22	0.16	0.13
s w	1.41	1.33	1.25	1.17	1.08	1.00	0.51	0.42	0.35	0.25	0.19
sw *by* w	2.20	2.10	1.59	1.48	1.36	1.25	1.13	1.05	0.48	0.37	0.28
w s w	3.14	3.00	2.46	2.31	2.17	2.01	1.45	1.29	1.11	0.55	0.43
w *by* s	4.28	4.11	3.53	3.39	3.17	3.00	2.38	2.16	1.52	1.31	1.13
West.	6.00	5.41	5.22	5.04	4.43	4.21	3.59	3.39	3.07	2.42	2.20
w *by* n					6.21	6.04	5.41	5.21	4.56	4.34	4.16
w n w									6.42	6.27	6.14
⊙ sets	6.00	6.05	6.11	6.16	6.22	6.27	6.33	6.39	6.45	6.50	6.53
Sun's Amp.	d. m 0.00	d. m 2.50	d. m 5.40	d. m 8.30	d m 11.21	d. m 14.11	d. m 17.3	d. m 19.56	d. m 22.48	d. m 25.6	d. m 26.52

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39
s s w	0.44	0.48	0.51	0.55	0.58	1.02	1.06	1.10	1.14	1.17	1.20
sw *by* s	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.51	1.57	2.03	2.06
s w	1.41	1.49	1.57	2.05	2.13	2.21	2.30	2.39	2.47	2.56	3.02
sw *by* w	2.20	2.31	2.42	2.53	3.04	3.16	3.28	3.40	3.53	4.04	4.13
w s w	3.14	3.28	3.43	3.57	4.12	4.27	4.43	5.00	5.18		
w *by* s	4.28	4.45	5.03	5.21	5.39						
West.	5.00										
⊙ sets	5.00	5.15	5.49	5.44	5.38	5.33	5.27	5.21	5.15	5.10	5.07

A Sun-Dial for the Latitude of 29 Degrees.

North Declination.

Deg.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.22	0.20	0.19	0.17	0.15	0.13	0.11	0.10	0.08	0.06	0.05
s s w	0.45	0.42	0.38	0.35	0.31	0.27	0.23	0.19	0.16	0.12	0.10
s w *b* s	1.12	1.06	1.01	0.55	0.49	0.43	0.37	0.31	0.25	0.20	0.16
s w	1.43	1.36	1.28	1.20	1.12	1.03	0.55	0.46	0.37	0.29	0.23
s w *b* w	2.24	2.13	2.03	1.52	1.41	1.30	1.18	1.06	0.53	0.42	0.34
w s w	3.18	3.04	2.50	2.36	2.22	2.07	1.52	1.35	1.18	1.03	0.51
w *by* s	4.31	4.31	4.57	3.40	3.22	3.04	2.45	2.24	2.01	1.41	1.24
West.	6.00	5.42	5.24	5.05	4.46	4.26	4.04	3.41	3.16	2.53	2.33
w *by* n					6.21	6.02	5.43	5.22	5.00	4.40	4.23
w n w									6.42	6.27	6.15
⊙ sets	6.00	6.06	6.11	6.17	6.23	6.28	6.34	6.40	6.47	6.52	6.56
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	2.51	5.43	8.34	11.27	14.19	17.12	20.8	24.32	25.22	27.8

South Declination.

Deg.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	37	0.38	0.39
s s w	0.45	0.49	0.53	0.56	1.00	1.04	1.08	1.11	15	1.18	1.21
s w *b* s	1.12	1.17	1.23	1.29	1.34	1.40	1.46	1.52	1.59	2.04	2.08
s w	1.43	1.51	1.59	2.07	2.15	2.24	2.32	2.41	2.50	2.58	3.04
s w *by* w	2.24	2.34	2.45	2.56	3.07	3.18	3.30	3.42	3.55	4.05	4.14
w s w	4.13	3.32	3.46	4.00	4.14	4.29	4.44	5.00			
w *by* s	5.34	4.48	5.04	5.22	5.39						
West.	6.00										
⊙ sets	6.00	5.54	5.49	5.43	5.37	5.32	5.26	5.20	5.13	5.08	5.04

A Sun-Dial for the Latitude of 30 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.23	0.21	0.19	0.18	0.16	0.14	0.12	0.10	0.08	0.07	0.06
s s w	0.47	0.43	0.40	0.36	0.33	0.29	0.25	0.21	0.17	0.14	0.12
sw *by* s	1.14	1.08	1.03	0.58	0.52	0.46	0.40	0.34	0.28	0.23	0.19
s w	1.46	1.38	1.31	1.23	1.15	1.07	0.58	0.50	0.41	0.33	0.27
sw *by* w	2.27	2.17	2.06	1.56	1.45	1.34	1.23	1.11	0.58	0.48	0.40
w s w	3.21	3.08	2.55	2.41	2.27	2.13	1.58	1.42	1.25	1.11	0.59
w *by* s	4.33	4.17	4.01	3.44	3.27	3.10	2.51	2.31	2.10	1.51	1.35
West.	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.48	3.24	3.02	2.44
w *by* n					6.21	6.03	5.45	5.25	5.03	4.45	4.29
w n w									0.42	6.28	6.17
⊙ sets	6.00	6.06	6.12	6.18	6.23	6.29	6.36	6.42	6.48	6.54	6.59
Sun's Amp.	d. m 0.00	d. m 2.53	d. m 5.46	d. m 8.40	d m 11.34	d. m 14.28	d. m 17.22	d. m 20.18	d. m 23.16	d. m 25.3	d. m 27.15

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.23	0.24	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40
s s w	0.47	0.50	0.54	0.57	1.01	1.05	1.08	1.12	1.16	1.19	1.22
sw *by* s	1.14	1.19	1.25	1.30	1.36	1.42	1.48	1.54	2.00	2.05	2.09
s w	1.46	1.54	2.02	2.10	2.18	2.26	2.34	2.43	2.52	2.59	3.05
sw *by* w	2.27	2.38	2.48	2.58	3.09	3.20	3.32	3.43	3.56	4.06	4.14
w s w	3.21	3.35	3.48	4.01	4.16	4.30	4.45	5.01			
w *by* s	3.33	4.49	5.05	5.22	5.39						
West.	6.00										
⊙ sets	6.00	5.54	5.48	5.42	5.37	5.31	5.24	5.18	5.12	5.06	5.01

A Sun-Dial for the Latitude of 31 Degrees.

North Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.23	0.22	0.20	0.18	0.17	0.15	0.13	0.11	0.09	0.08	0.07
s s w	0.48	0.45	0.41	0.38	0.34	0.31	0.27	0.23	0.19	0.16	0.13
s w *b* s	1.16	1.11	1.05	1.00	0.54	0.48	0.43	0.37	0.31	0.25	0.21
s w	1.49	1.41	1.34	1.26	1.18	1.10	1.02	0.53	0.45	0.37	0.32
sw *b* w	2.30	2.20	2.10	2.00	1.49	1.38	1.27	1.16	1.04	0.54	0.46
w s w	3.25	3.12	2.59	2.45	2.32	2.18	2.03	1.48	1.32	1.18	1.07
w *by* s	4.36	4.20	4.04	3.48	3.32	3.15	2.57	2.38	2.18	2.00	1.46
West.	6.00	5.43	5.26	5.09	4.52	4.33	4.14	3.53	3.31	3.11	2.55
w *by* n					6.21	6.04	5.46	5.27	5.07	4.49	4.35
w n w									6.43	6.29	6.18
⊙ sets	6.00	6.06	6.12	6.18	6.24	6.31	6.37	6.44	6.51	6.56	7.01
Sun's	d. m	d m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	2.55	5.50	8.45	11.41	14.37	17.34	20.31	23.31	25.55	27.43

South Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39	0.40
s s w	0.48	0.52	0.55	0.59	1.02	1.06	1.10	1.13	1.17	1.20	1.23
s w *b* s	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.55	2.01	2.07	2.11
s w	1.49	1.57	2.04	2.12	2.20	2.28	2.36	2.45	2.53	3.01	3.06
sw *by* w	2.30	2.41	2.51	3.01	3.12	3.33	3.34	3.45	3.57	4.07	4.15
w s w	3.25	3.38	3.51	4.04	4.18	4.32	4.46	5.01	5.17		
w *by* s	4.36	4.50	5.07	5.23							
West.	6.00										
⊙ sets	6.00	5.54	5.48	5.42	5.36	5.29	5.23	5.16	5.09	5.04	5.59

A Sun-Dial for the Latitude of 32 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.12	0.10	0.09	0.07
s s w	0.50	0.46	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0.18	0.15
sw *by* s	1.18	1.13	1.07	1.02	0.56	0.51	0.45	0.39	0.33	0.28	0.24
s w	1.52	1.44	1.37	1.29	1.22	1.14	1.05	0.56	0.48	0.41	0.35
sw *by* w	2.34	2.24	2.14	2.04	1.54	1.43	1.32	1.21	1.09	0.59	0.51
w s w	3.28	3.15	3.03	2.50	2.37	2.23	2.09	1.54	1.39	1.25	1.15
w *by* s	4.38	4.23	4.08	3.52	3.37	3.20	3.03	2.45	2.26	2.09	1.55
West.	6.00	5.44	5.28	5.11	4.55	4.37	4.21	3.59	3.38	3.19	3.04
w *by* n					6.22	6.05	5.48	5.30	5.10	4.53	4.39
w n w									6.43	6.30	6.19
⊙ sets	6.00	6.06	6.13	6.19	6.25	6.32	6.39	6.46	6.53	6.58	7.03
Sun's Amp.	d. m 3.00	d. m 2.57	d. m 5.54	d. m 8.51	d. m 11.48	d. m 14.47	d. m 17.46	d. m 19.47	d. m 22.17	d. m 26.43	d. m 28.3

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.24	0.26	0.27	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41
s s w	0.50	0.53	0.56	1.00	1.03	1.07	1.10	1.14	1.18	1.21	1.24
sw *by* s	1.18	1.23	1.29	1.34	1.40	1.45	1.51	1.57	2.03	2.08	2.12
s w	1.52	1.59	2.07	2.14	2.22	2.30	2.38	2.45	2.51	3.02	3.08
sw *by* w	2.34	2.44	2.54	3.04	3.14	3.25	3.35	3.47	3.59	4.08	4.16
w s w	3.28	3.41	3.53	4.06	4.19	4.33	4.47	5.02			
w *by* s	4.38	4.53	5.08	5.53							
West.	6.00										
⊙ sets	6.00	5.54	5.47	5.41	5.35	5.28	5.21	5.14	5.07	5.02	4.57

A Sun-Dial for the Latitude of 33 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.25	0.23	0.21	0.20	0.18	0.16	0.15	0.13	0.11	0.09	0.08
s s w	0.51	0.47	0.44	0.41	0.37	0.34	0.30	0.27	0.23	0.19	0.17
sw *by* s	1.20	1.15	1.09	1.04	0.59	0.53	0.48	0.42	0.36	0.31	0.27
s w	1.54	1.47	1.40	1.32	1.24	1.17	1.09	1.01	0.53	0.46	0.41
swbyw	2.37	2.27	2.17	2.07	1.57	1.47	1.36	1.25	1.14	1.04	1.57
w s w	3.31	3.19	3.06	2.54	2.41	2.28	2.14	2.00	1.45	1.32	1.22
w *by* s	4.40	4.25	4.11	3.56	3.41	3.25	3.09	2.51	2.33	2.17	2.04
West.	6.00	5.45	5.29	5.13	4.57	4.40	4.23	4.04	3.44	3.26	3.12
w *by* n					6.21	6.05	5.49	5.32	5.15	4.57	4.44
w n w									6.43	6.30	6.20
⊙ sets	6.00	6.07	6.13	6.20	6.26	6.33	6.40	6.47	6.55	7.01	7.06
Sun's Amp.	d. m 0.00	d. m 2.59	d. m 5.58	d. m 8.57	d. m 11.57	d. m 14.57	d. m 17.58	d. m 21.1	d. m 24.24	d. m 26.31	d. m 28.24

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.25	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40	0.41
s s w	0.51	0.54	0.58	1.01	1.05	1.08	1.12	1.15	1.19	1.22	1.25
sw *by* s	1.20	1.25	1.30	1.36	1.41	1.47	1.52	1.58	2.04	2.09	2.13
s w	1.54	2.02	2.09	2.17	2.24	2.32	2.40	2.48	2.58	3.05	3.10
swbyw	2.37	2.46	2.56	3.06	3.16	3.27	3.37	3.48	4.00	4.09	4.17
w s w	3.31	3.43	3.56	4.08	4.21	4.34	4.48	5.02			
w *by* s	4.40	4.54	5.09	5.24							
West.	6.00										
⊙ sets	6.00	5.53	5.47	5.40	5.34	5.27	5.20	5.13	5.05	4.59	4.54

A Sun-Dial for the Latitude of 34 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.25	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0.12	0.10	0.09
s s w	0.52	0.49	0.45	0.42	0.39	0.35	0.32	0.28	0.24	0.21	0.19
sw *by* s	1.22	1.17	1.12	1.07	1.01	0.56	0.50	0.44	0.38	0.34	0.30
s w	1.57	1.50	1.42	1.35	1.28	1.20	1.12	1.04	0.56	0.49	0.43
sw *by* w	2.40	2.30	2.21	2.11	2.01	1.51	1.41	1.30	1.19	1.09	1.02
w s w	3.34	3.22	3.10	2.58	2.45	2.33	2.19	2.06	1.51	1.39	1.29
w *by* s	4.42	4.28	4.14	3.59	3.45	3.30	3.14	2.57	2.40	2.24	2.12
West.	6.00	5.45	5.30	5.15	5.09	4.43	4.26	4.09	3.49	3.33	3.19
w *by* n					6.21	6.06	5.50	5.32	5.16	5.01	4.49
w n w									6.43	6.31	6.21
⊙ sets	6.00	6.07	6.14	6.20	6.27	6.34	6.42	6.49	6.57	7.03	7.08
Sun's Amp.	d. m 0.00	d. m 3.01	d. m 6.01	d. m 9.03	d. m 12.5	d. m 15.8	d. m 18.12	d. m 21.16	d. m 24.22	d. m 26.52	d. m 28.45

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.37	0.39	0.41	0.42
s s w	0.52	0.55	0.59	1.02	1.06	1.09	1.13	1.16	1.20	1.23	1.26
sw *by* s	1.22	1.27	1.32	1.38	1.43	1.48	1.54	2.00	2.05	2.10	2.14
s w	1.57	2.04	2.11	2.19	2.26	2.34	2.42	2.50	2.58	3.05	3.10
sw *by* w	2.40	2.49	2.59	3.09	3.18	3.28	3.39	3.50	4.01	4.10	4.18
w s w	3.34	3.46	3.58	4.10	4.22	4.35	4.48	5.02			
w *by* s	4.42	4.56	5.10	5.24							
West.	6.00										
⊙ sets	6.00	5.53	5.46	5.40	5.33	5.26	5.18	5.11	5.03	4.57	4.52

A Sun-Dial for the Latitude of 35 Degrees.

North Declination.

Deg. / Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.11	0.10
s s w	0.53	0.50	0.47	0.44	0.40	0.37	0.33	0.30	0.26	0.23	0.20
s w *by* s	1.24	1.19	1.14	1.08	1.03	0.58	0.52	0.47	0.41	0.36	0.32
s w	1.59	1.52	1.45	1.38	1.31	1.23	1.15	1.08	0.59	0.53	0.47
s w *by* w	2.43	2.33	2.24	2.14	2.05	1.55	1.45	1.34	1.23	1.14	1.07
w s w	3.37	3.25	3.13	3.02	2.50	2.37	2.24	2.11	1.57	1.45	1.36
w *by* s	4.43	4.29	4.16	4.03	3.48	3.34	3.19	3.01	2.46	2.31	2.20
West.	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26
w *by* n					6.21	6.07	5.52	5.38	5.19	5.04	4.53
w n w									6.44	6.32	6.22
☉ sets	6.00	6.07	6.14	6.21	6.28	6.35	6.43	6.51	6.59	7.06	7.11
Sun's Amp.	d. m 0.00	d. m 3.03	l. m 6.06	d. m 9.10	d. m 12.14	d. m 15.18	d. m 18.25	d. m 21.32	d. m 24.40	d. m 27.12	d. m 29.8

South Declination.

Deg / Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.26	0.28	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41	0.42
s s w	0.53	0.57	1.00	1.04	1.07	1.10	1.14	1.17	1.21	1.24	1.27
s w *by* s	1.24	1.29	1.34	1.39	1.45	1.50	1.55	2.01	2.07	2.12	2.15
s w	1.59	2.06	2.14	2.21	2.28	2.36	2.43	2.51	2.59	3.06	3.11
s w *by* w	2.43	2.52	3.01	3.11	3.20	3.30	3.40	3.51	4.02	4.11	4.18
w s w	3.37	3.48	4.00	4.12	4.24	4.36	4.49	5.02			
w *by* s	4.43	4.57	5.11	5.24							
West.	6.00										
☉ sets	6.00	5.53	5.46	5.39	5.32	5.25	5.17	5.09	5.01	4.54	4.49

A Sun-Dial for the Latitude of 36 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.15	0.13	0.12	0.11
s s w	0.55	0.51	0.48	0.45	0.42	0.38	0.35	0.31	0.28	0.24	0.22
sw *by* s	1.26	1.21	1.16	1.11	1.05	1.00	0.55	0.49	0.44	0.39	0.35
s w	2.02	1.55	1.48	1.41	1.34	1.26	1.19	1.11	1.04	0.56	0.51
sw *by* w	2.45	2.36	2.27	2.18	2.08	1.59	1.49	1.39	1.28	1.19	1.12
w s w	3.39	3.28	3.17	3.05	2.53	2.41	2.29	2.16	2.03	1.51	1.42
w *by* s	4.45	4.32	4.19	4.06	3.52	3.38	3.23	3.08	2.52	2.38	2.27
West.	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33
w *by* n					6.22	6.08	5.53	5.38	5.22	5.08	4.57
w n w									6.44	6.33	6.24
⊙ sets	6.00	6.07	6.15	6.22	6.29	6.37	6.45	6.53	7.01	7.08	7.14
Sun's Amp.	d. m 0.00	d. m 3.06	d. m 6.11	d. m 9.17	d. m 12.24	d. m 15.3	d. m 18.40	d. m 21.49	d. m 25.0	d. m 27.35	d. m 29.32

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.27	0.28	0.30	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.43
s s w	0.55	0.58	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.27
sw *by* s	1.26	1.31	1.36	1.41	1.46	1.51	1.57	2.02	2.08	2.13	2.16
s w	2.02	2.09	2.16	2.23	2.30	2.27	2.45	2.53	3.01	3.07	3.12
sw *by* w	2.45	2.54	3.04	3.13	3.22	3.32	3.42	3.52	4.03	4.12	4.18
w s w	3.39	3.51	4.02	4.13	4.25	4.37	4.49	5.02			
w *by* s	4.45	4.58	5.11	5.25							
West.	6.00										
⊙ sets	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46

A Sun-Dial for the Latitude of 37 Degrees.

North Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.27	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.12
s s w	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.29	0.26	0.24
sw *by* s	1.28	1.23	1.18	1.13	1.08	1.02	0.57	0.52	0.47	0.41	0.38
s w	2.04	1.57	1.50	1.43	1.36	1.29	1.22	1.14	1.07	1.00	0.55
sw *by* w	2.48	2.39	2.30	2.21	2.12	2.03	1.53	1.43	1.33	1.24	1.17
w s w	3.42	3.31	3.20	3.09	2.57	2.46	2.34	2.21	2.08	1.57	1.48
w *by* s	4.47	4.34	4.21	4.09	3.56	3.42	3.28	3.13	2.58	2.45	2.34
West.	6.00	5.47	5.33	5.19	5.06	4.52	4.37	4.21	4.05	3.50	3.39
w *by* n					6.22	6.08	5.54	5.40	5.24	5.11	5.00
w n w									6.44	6.33	6.25
⊙ sets	6.00	6.08	6.15	6.23	6.31	6.39	6.47	6.55	7.04	7.11	7.17
Sun's Amp.	d. m 0.00	d. m 3.08	d. m 6.16	d. m 9.25	d. m 12.33	d. m 16.2	d. m 18.85	d. m 22.7	d. m 25.22	d. m 27.58	d. m 29.58

South Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.27	0.29	0.31	0.32	0.34	0.35	0.37	0.39	0.41	0.42	0.43
s s w	0.56	0.59	1.02	1.06	1.09	1.12	1.16	1.19	1.23	1.26	1.22
sw *by* s	1.28	1.33	1.37	1.42	1.47	1.53	1.58	2.04	2.09	2.14	2.17
s w	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.54	3.01	3.03	3.13
sw *by* w	2.48	2.57	3.06	3.15	3.24	3.33	3.43	3.53	4.03	4.12	4.19
w s w	3.42	3.53	4.04	4.15	4.26	4.38	4.50	5.03			
w *by* s	4.47	5.00	5.12	5.25							
West.	6.00										
⊙ sets	6.00	5.52	5.45	5.37	5.29	5.21	5.13	5.05	4.56	4.49	4.43

A Sun-Dial for the Latitude of 38 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.28	0.26	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0.13	0.12
s s w	0.57	0.54	0.51	0.48	0.45	0.41	0.38	0.34	0.31	0.28	0.26
sw *by* s	1.29	1.24	1.20	1.15	1.10	1.05	1.00	0.54	0.49	0.44	0.41
s w	2.06	2.00	1.53	1.46	1.39	1.32	1.25	1.18	1.10	1.04	0.59
sw *by* w	2.51	2.42	2.33	2.24	2.15	2.06	1.57	1.47	1.37	1.29	1.12
w s w	3.44	3.34	3.23	3.12	3.01	2.50	2.39	2.26	2.13	2.03	1.54
w *by* s	4.48	4.36	4.24	4.12	4.01	3.46	3.33	3.18	3.03	2.50	2.40
West.	6.00	5.47	5.34	5.21	5.08	4.54	4.41	4.25	4.09	3.55	3.45
w *by* n					6.22	6.09	5.56	5.41	5.26	5.14	5.04
w n w									6.45	6.34	6.26
⊙ sets	6.00	6.08	6.16	6.24	6.32	6.40	6.48	6.57	7.06	7.14	7.19
Sun's Amp.	d. m 0.00	d. m 3.10	d. m 6.21	d. m 9.32	d. m 12.43	d. m 15.58	d. m 19.10	d. m 22.26	d. m 25.43	d. m 28.23	d. m 30.25

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.44
s s w	0.57	1.00	1.04	1.07	1.10	1.13	1.16	1.20	1.24	1.27	1.29
sw *by* s	1.29	1.34	1.39	1.44	1.49	1.54	1.59	2.05	2.10	2.15	2.18
s w	2.06	2.13	2.20	2.27	2.34	2.41	2.48	2.55	3.03	3.09	3.14
sw *by* w	2.51	2.59	3.08	3.17	3.26	3.35	3.44	3.54	4.04	4.13	4.19
w s w	3.44	3.55	4.06	4.17	4.28	4.39	4.50	5.02			
w *by* s	4.48	5.00	5.13	5.25							
West.	6.00										
⊙ sets	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.41

A Sun-Dial for the Latitude of 39 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.13
s s w	0.58	0.55	0.52	0.49	0.46	0.43	0.39	0.36	0.32	0.30	0.27
sw *by* s	1.31	1.26	1.22	1.17	1.12	1.07	1.02	0.57	0.51	0.47	0.43
s w	2.09	2.02	1.55	1.49	1.42	1.35	1.28	1.21	1.13	1.07	1.02
sw *by* w	2.53	2.45	2.36	2.27	2.19	2.10	2.01	1.51	1.41	1.33	1.27
w s w	3.47	3.36	3.26	3.15	3.05	2.54	2.42	2.31	2.18	2.08	2.00
w *by* s	4.50	4.38	4.26	4.14	4.02	3.49	3.36	3.23	3.08	2.56	2.47
West.	6.00	5.48	5.35	5.22	5.10	4.56	4.43	4.28	4.13	4.00	3.50
w *by* n					6.22	6.10	5.57	5.43	5.29	5.16	5.07
w n w									6.45	6.35	6.27
⊙ sets	6.00	6.08	6.16	6.24	6.33	6.41	6.50	6.59	7.09	7.16	7.22
Sun's Amp.	d. m 0.00	d. m 3.13	d. m 6.26	d. m 9.40	d. m 12.55	d. m 16.10	d. m 19.27	d. m 22.45	d. m 26.7	d. m 28.49	d. m 30.53

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.40	0.41	0.43	0.44
s s w	0.58	1.02	1.05	1.08	1.11	1.14	1.18	1.21	1.25	1.27	1.30
sw *by* s	1.31	1.36	1.41	1.46	1.51	1.56	2.01	2.06	2.11	2.16	2.19
s w	2.09	2.15	2.22	2.29	2.35	2.42	2.49	2.57	3.04	3.10	3.15
sw *by* w	2.53	3.02	3.10	3.19	3.27	3.36	3.46	3.55	4.05	4.13	4.20
w s w	3.47	3.57	4.08	4.18	4.29	4.39	4.51	5.03			
w *by* s	4.50	5.02	5.14	5.26							
West.	6.00										
⊙ sets	6.00	5.52	5.44	5.36	5.27	5.19	5.10	5.01	4.51	4.44	4.38

A Sun-Dial for the Latitude of 40 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,29	0,28	0,26	0,24	0,23	0,21	0,20	0,18	0,17	0,15	0,14
s s w	1,00	0,57	0,53	0,50	0,47	0,44	0,41	0,37	0,34	0,31	0,29
sw *by* s	1,33	1,28	1,26	1,19	1,14	1,09	1,04	0,59	0,54	0,49	0,46
s w	2,11	2,04	1,58	1,51	1,45	1,38	1,31	1,24	1,17	1,11	1,06
sw *by* w	2,56	2,47	2,39	2,30	2,22	2,14	2,04	1,55	1,46	1,38	1,31
w s w	3,49	3,39	3,29	3,18	3,08	2,58	2,47	2,35	2,23	2,13	2,05
w *by* s	4,51	4,40	4,28	4,17	4,05	3,53	3,40	3,27	3,13	3,02	2,52
West.	6,00	5,48	5,36	5,23	5,11	4,59	4,46	4,32	4,17	4,05	3,55
w *by* n					6,22	6,11	5,58	5,45	5,31	5,19	5,10
w n w								6,58	6,46	6,36	6,28
⊙ sets	6,00	6,08	6,17	6,25	6,34	6,43	6,52	7,01	7,11	7,19	7,26
Sun's Amp.	d. m 0,00	d. m 3,14	d. m 6,32	d. m 9,48	d. m 13,6	d. m 16.24	d. m 19.45	d. m 23,6	d. m 26.31	d. m 29.26	d. m 31.22

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,29	0,31	0,32	0,34	0,35	0,37	0,38	0,40	0,42	0,43	0,44
s s w	1,00	1,03	1,06	1,09	1,12	1,15	1,18	1,22	1,25	1,28	1,30
sw *by* s	1,33	1,38	1,43	1,47	1,52	1,57	2,02	2,07	2,12	2,17	2,20
s w	2,11	2,17	2,24	2,31	2,37	2,44	2,51	2,58	3,05	3,11	3,16
sw *by* w	2,56	3,04	3,12	3,21	3,29	3,38	3,47	3,56	4,06	4,14	4,20
w s w	3,49	3,59	4,09	4,19	4,30	4,40	4,51				
w *by* s	4,51	5,03	5,14	5,26							
West.	6,00										
⊙ sets	6,00	5,52	5,43	5,35	5,26	5,17	5,08	4,59	4,49	4,41	4,34

A Sun-Dial for the Latitude of 41 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,30	0,28	0,27	0,25	0,24	0,22	0,21	0,19	0,17	0,16	0,15
s s w	1,01	0,58	0,55	0,52	0,49	0,46	0,42	0,39	0,36	0,33	0,31
sw *by* s	1,35	1,30	1,25	1,21	1,16	1,11	1,06	1,01	0,56	0,52	0,48
s w	2,13	2,07	2,00	1,54	1,48	1,41	1,34	1,27	1,20	1,14	1,09
sw *by* w	3,58	2,50	2,42	2,33	2,25	2,17	2,08	1,59	1,50	1,42	1,36
w s w	3,51	3,41	3,31	3,21	3,11	3,01	2,50	2,39	2,28	2,18	2,11
w *by* s	4,53	4,42	4,30	4,19	4,08	3,57	3,44	3,31	3,18	3,07	2,58
West.	6,00	5,48	5,36	5,25	5,13	5,01	4,48	4,35	4,21	4,09	4,00
w *by* n					6,23	6,12	5,59	5,46	5,33	5,22	5,13
w n w									6,46	6,37	6,29
⊙ sets	6,00	6,09	6,17	6,26	6,35	6,44	6,54	7,04	7,14	7,22	7,29
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	3,18	6,38	9,57	13.18	16.40	20,4	22.20	26.57	29.46	31.54

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,39	0,31	0,33	0,34	0,36	0,37	0,39	0,40	0,42	0,44	0,45
s s w	1,01	1,04	1,07	1,10	1,13	1,16	1,19	1,23	1,26	1,29	1,31
sw *by* s	1,35	1,39	1,44	1,49	1,53	1,58	2,03	2,08	2,13	2,18	2,21
s w	2,13	2,19	2,26	2,32	2,39	2,45	2,52	2,59	3,06	3,12	3,17
sw *by* w	2,58	3,06	3,14	3,22	3,31	3,39	3,48	3,57	4,06	4,14	4,20
w s w	3,51	4,01	4,11	4,21	4,30	4,40	4,51	5,02			
w *by* s	4,53	5,04	5,15	5,26							
West.	6,00										
⊙ sets	6,00	5,51	5,43	5,34	5,25	5,16	5,06	4,56	4,46	4,38	4,31

A Sun-Dial for the Latitude of 42 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,30	0,29	0,27	0,26	0,24	0,23	0,21	0,20	0,18	0,17	0,16
s s w	1,02	0,59	0,56	0,53	0,50	0,47	0,44	0,41	0,37	0,34	0,32
sw *by* s	1,36	1,32	1,27	1,23	1,18	1,14	1,09	1,04	0,58	0,54	0,51
s w	2,15	2,09	2,03	1,56	1,50	1,44	1,37	1,30	1,23	1,17	1,13
sw *by* w	3,00	2,52	2,44	2,36	2,28	2,20	2,12	2,03	1,54	1,46	1,40
w s w	3,53	3,43	3,34	3,24	3,15	3,05	2,54	2,44	2,33	2,23	2,16
w *by* s	4,54	4,43	4,32	4,21	4,10	4,00	3,47	3,36	3,23	3,12	3,03
West.	6,00	5,49	5,37	5,26	5,15	5,03	4,51	4,39	4,25	4,13	4,04
w *by* n					6,23	6,12	6,00	5,49	5,35	5,24	5,16
w n w								6,58	6,47	6,37	6,30
⊙ sets	6,00	6,09	6,18	6,27	6,37	6,46	6,56	7,06	7,17	7,25	7,32
Sun's Amp.	d. m 0,00	d. m 3,21	d. m 6,44	d. m 10,6	d. m 13,31	d. m 16.57	d. m 20.23	d. m 23.52	d. m 27.24	d. m 30.16	d. m 32.17

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,30	0,32	0,33	0,35	0,36	0,38	0,39	0,41	0,43	0,44	0,45
s s w	1,02	1,05	1,08	1,11	1,14	1,17	1,20	1,23	1,27	1,30	1,32
sw *by* s	1,36	1,41	1,46	1,50	1,55	1,59	2,04	2,09	2,14	2,19	2,22
s w	2,15	2,21	2,28	2,34	2,40	2,46	2,53	3,00	3,07	3,13	3,17
sw *by* w	3,00	3,08	3,16	3,24	3,32	3,40	3,49	3,57	4,07	4,14	4,20
w s w	3,53	4,02	4,12	4,22	4,31	4,41	4,52				
w *by* s	4,45	5,04	5,15	5,26							
West.	6,00										
⊙ sets	6,00	5,51	5,42	5,33	5,23	5,14	5,04	0,54	4,43	4,35	4,28

A Sun-Dial for the Latitude of 43 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
S *by* W	0,31	0,29	0,28	0,27	0,25	0,24	0,22	0,21	0,19	0,18	0,17
S S W	1,03	1,00	0,57	0,54	0,51	0,48	0,45	0,42	0,39	0,36	0,34
SW *by* S	1,38	1,34	1,29	1,24	1,20	1,15	1,11	1,06	1,01	0,57	0,53
S W	2,17	2,11	2,05	1,59	1,53	1,47	1,40	1,33	1,26	1,20	1,16
SW *by* W	3,02	2,55	2,47	2,39	2,31	2,23	2,15	2,07	1,58	1,50	1,44
W S W	3,55	3,46	3,36	3,27	3,18	3,08	2,58	2,48	2,37	2,28	2,21
W *by* S	4,55	4,45	4,34	4,23	4,13	4,03	3,51	3,40	3,27	3,17	3,09
West.	6,00	4,49	5,38	5,27	5,16	5,05	4,53	4,41	4,27	4,17	4,19
W *by* N					6,23	6,13	6,01	5,50	5,37	5,27	5,19
W N W								6,58	6,47	6,38	6,31
⊙ sets	6,00	6,09	6,19	6,28	6,38	6,48	6,58	7,09	7,19	7,28	7,36
Sun's Amp.	d. m 0,00	d. m 3,25	d. m 6,51	d. m 10.17	d. m 13.44	d. m 17.12	d. m 20.42	d. m 24.16	d. m 27.53	d. m 30.48	d. m 33.2

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
S *by* W	0,31	0,32	0,34	0,35	0,37	0,38	0,40	0,41	0,43	0,44	0,45
S S W	1,03	1,06	1,09	1,12	1,15	1,18	1,21	1,24	1,27	1,30	1,32
SW *by* S	1,38	1,42	1,47	1,52	1,56	2,01	2,05	2,10	2,15	2,19	2,23
S W	2,17	2,23	2,29	2,36	2,42	2,48	2,54	3,01	3,08	3,14	3,18
SW *by* W	3,02	3,10	3,18	3,26	3,33	3,41	3,50	3,58	4,07	4,14	4,20
W S W	3,55	4,04	4,14	4,23	4,32	4,42	4,52				
W *by* S	4,55	5,05	5,16	5,27							
West.	6,00										
⊙ sets	6,00	5,51	5,41	5,32	5,22	5,12	5,02	4,51	4,41	4,32	4,24

A Sun-Dial for the Latitude of 44 *Degrees.*

North Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17
s s w	1.04	1.01	0.58	0.56	0.53	0.50	0.47	0.44	0.40	0.38	0.36
sw *by* s	1.40	1.35	1.31	1.27	1.22	1.18	1.13	1.08	1.03	0.59	0.56
s w	2.19	2.13	2.07	2.01	1.55	1.49	1.43	1.36	1.29	1.24	1.20
sw *by* w	3.04	2.57	2.49	2.42	2.34	2.26	2.18	2.10	2.01	1.54	1.49
w s w	3.57	3.48	3.38	3.29	3.21	3.12	3.02	2.52	2.41	2.33	2.26
w *by* s	4.56	4.46	4.36	4.25	4.16	4.05	3.54	3.43	3.31	3.21	3.13
West.	6.00	5.50	5.39	5.28	5.18	5.07	4.56	4.44	4.31	4.21	4.13
w *by* n					6.23	6.13	6.02	5.51	5.39	5.29	5.21
w n w								6.59	6.48	6.39	6.31
⊙ sets	6.00	6.10	6.19	6.29	6.39	6.49	7.00	7.11	7.22	7.31	7.39
Sun's Amp.	d. m 0.00	d. m 3.28	d. m 6.58	d. m 10.27	d m 13.58	d. m 13.20	d. m 21.5	d. m 24.42	d. m 28.23	d. m 31.23	d. m 33.41

South Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.46
s s w	1.04	1.07	1.10	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.33
sw *by* s	1.40	1.44	1.48	1.53	1.57	2.02	2.06	2.11	2.16	2.20	2.23
s w	2.19	2.25	2.31	2.37	2.43	2.49	2.56	3.02	3.09	3.14	3.19
sw *by* w	3.04	3.12	3.19	3.27	3.35	3.42	3.51	3.59	4.08	4.15	4.20
w s w	3.57	4.06	4.15	4.24	4.33	4.42	4.52				
w *by* s	4.56	5.06	5.16	5.27							
West.	6.00										
⊙ sets	6.00	5.50	5.41	5.31	5.21	5.11	5.00	4.49	4.38	4.29	4.21

A Sun-Dial for the Latitude of 45 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.22	0.20	0.19	0.18
s s w	1.05	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.37
s w *b* s	1.41	1.37	1.33	1.28	1.24	1.19	1.15	1.10	1.05	1.01	0.58
s w	2.21	2.15	2.09	2.03	1.58	1.52	1.45	1.39	1.33	1.27	1.23
sw *b* w	3.06	2.59	2.52	2.45	2.37	2.29	2.22	2.13	2.05	1.58	1.53
w s w	3.59	3.50	3.41	3.32	3.23	3.14	3.05	2.55	2.45	2.37	2.30
w *by* s	4.57	4.47	4.38	4.28	4.18	4.08	3.57	3.46	3.35	3.26	3.18
West.	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.46	4.35	4.25	4.17
w *by* n					6.24	6.14	6.03	5.52	5.41	5.31	5.24
w n w								6.58	6.48	6.40	6.33
nw *bw*											7.40
⊙ sets	6.00	6.10	6.20	6.30	6.41	6.51	7.02	7.13	7.25	7.35	7.43
Sun's Amp.	d. m 0.00	d. m 3.32	d. m 7.05	d. m 10.38	d. m 14.13	d. m 17.49	d. m 21.28	d. m 25.5	d. m 28.50	d. m 32.0	d. m 34.20

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.46
s s w	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.31	1.33
s w *b* s	1.41	1.45	1.50	1.54	1.58	2.03	2.07	2.12	2.17	2.21	2.24
s w	2.21	2.27	2.33	2.39	2.44	2.51	2.57	3.03	3.10	3.15	3.19
sw *by* w	3.06	3.14	3.21	3.28	3.36	3.44	3.51	4.00	4.08	4.15	
w s w	3.59	4.07	4.16	4.25	4.34	4.43	4.52				
w *by* s	4.57	5.07	5.17	5.26							
West.	6.00										
⊙ sets	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.47	4.35	4.25	4.17

A Sun-Dial for the Latitude of 46 Degrees.

North Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.33	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19
s s w	1.06	1.04	1.01	0.58	0.55	0.52	0.49	0.46	0.43	0.41	0.39
sw *by* s	1.43	1.38	1.34	1.30	1.26	1.21	1.17	1.12	1.08	1.04	1.01
s w	2.23	2.17	2.11	2.06	2.00	1.54	1.48	1.42	1.36	1.30	1.26
sw *by* w	3.08	3.01	2.54	2.47	2.40	2.32	2.25	2.17	2.09	2.02	1.57
w s w	4.00	3.52	3.43	3.35	3.26	3.17	3.08	2.59	2.49	2.41	2.35
w *by* s	4.58	4.49	4.39	4.30	4.20	4.11	4.00	3.50	3.39	3.30	3.23
West.	6.00	5.50	5.40	5.30	5.20	5.11	5.00	4.49	4.38	4.28	4.21
w *by* n					6.24	6.14	6.04	5.54	5.43	5.33	5.26
w n w								6.59	6.49	6.41	6.34
nw *b* w											7.40
⊙ sets	6.00	6.10	6.21	6.31	6.42	6.53	7.04	7.16	7.29	7.39	7.47
Sun's	d. m	d. m	d. m	d. m	d m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	3.36	7.11	10.50	14.27	18.9	21.53	25.39	29.30	32.37	35.2

South Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46
s s w	1.06	1.09	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34
sw *by* s	1.43	1.47	1.51	1.55	2.00	2.04	2.08	2.13	2.18	2.22	2.25
s w	2.23	2.29	2.34	2.40	2.46	2.52	2.58	3.04	3.10	3.16	3.20
sw*by*w	3.08	3.16	3.23	3.30	3.37	3.45	3.52	4.00	4.08	4.15	
w s w	4.00	4.09	4.17	4.26	4.34	4.43					
w *by* s	4.58	5.08	5.17	5.26							
West.	6.00										
⊙ sets	6.00	5.50	5.39	5.29	5.18	5.07	4.56	4.44	4.31	4.21	4.13

A Sun-Dial for the Latitude of 47 Degrees.

North Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21	0.20
s s w	1.07	1.05	1.02	0.59	0.56	0.54	0.51	0.48	0.45	0.42	0.40
s w *b* s	1.44	1.34	1.36	1.32	1.28	1.23	1.19	1.15	1.10	1.06	1.03
s w	2.25	2.19	2.14	2.08	2.02	1.57	1.51	1.45	1.39	1.33	1.29
sw *b* w	3.10	3.03	2.56	2.49	2.42	2.35	2.28	2.20	2.14	2.06	2.01
w s w	4.02	3.54	3.46	3.57	3.29	3.20	3.12	3.03	2.53	2.45	2.39
w *by* s	4.59	4.50	4.41	4.32	4.23	4.13	4.03	3.53	3.43	3.34	3.27
West.	6.00	5.51	5.41	5.32	5.22	5.12	5.03	4.52	4.41	4.31	4.24
w *by* n				6.34	6.25	6.15	6.05	5.55	5.44	5.36	5.29
w n w							7.08	6.59	6.49	6.42	6.35
nw *b* w											7.40
⊙ sets	6.00	6.11	6.22	6.33	6.44	6.55	7.07	7.20	7.32	7.43	7.51
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	3.40	7.21	11.2	14.45	18.30	22.18	26.10	30.7	33.19	35.48

South Declination.

Deg. Min.	o d	2 d 30m	5 d	7 d 30n	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.33	0.34	0.36	0.37	0.38	0.48	0.41	0.43	0.44	0.45	0.46
s s w	1.07	1.10	1.13	1.16	1.18	1.21	1.24	1.27	1.30	1.22	1.34
s w *b* s	1.44	1.48	1.52	1.57	2.01	2.05	2.09	2.14	2.18	2.22	2.25
s w	2.25	2.30	2.36	2.41	2.47	2.53	2.59	3.05	3.11	3.16	3.20
sw *by* w	3.10	3.17	3.24	3.31	3.38	3.45	3.53	4.00	4.07	4.15	
w s w	4.02	4.10	4.18	4.26	4.35	4.43					
w *by* s	4.59	5.08	5.17								
West.	6.00										
⊙ sets	6.00	5.49	5.38	5.27	5.16	5.05	4.53	4.40	4.28	4.17	4.09

A Sun-Dial for the Latitude of 48 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.34	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21
s s w	1.08	1.06	1.03	1.00	0.58	0.55	0.52	0.49	0.46	0.44	0.42
sw *by* s	1.46	1.42	1.38	1.34	1.30	1.25	1.21	1.17	1.12	1.08	1.05
s w	2.26	2.21	2.16	2.10	2.05	1.59	1.53	1.47	1.41	1.36	1.32
sw *by* w	3.12	3.05	2.59	2.52	2.45	2.39	2.31	2.23	2.16	2.09	2.04
w s w	4.03	3.56	3.48	3.40	3.32	3.23	3.15	3.06	2.57	2.49	2.43
w *by* s	5.00	4.51	4.43	4.34	4.25	4.16	4.06	3.56	3.46	3.38	3.31
West.	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28
w *by* n					6.25	6.16	6.06	5.56	5.46	5.38	5.31
w n w							7.08	6.59	6.50	6.42	6.36
nw *bw*										7.45	7.40
⊙ ſets	6.00	6.11	6.22	6.33	6.45	6.57	7.09	7.22	7.35	7.47	7.56
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	3.49	7.29	11.15	15.2	18.52	22.45	26.43	30.45	34.3	36.34

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.34	0.35	0.36	0.38	0.39	0.40	0.42	0.43	0.45	0.47	0.47
s s w	1.08	1.11	1.14	1.16	1.19	1.22	1.25	1.28	1.31	1.33	1.35
sw *by* s	1.46	1.50	1.54	1.58	2.02	2.06	2.10	2.15	2.19	2.23	2.26
s w	2.26	2.32	2.37	2.43	2.48	2.54	3.00	3.05	3.12	3.17	3.21
sw *by* w	3.12	3.19	3.26	3.32	3.39	3.45	3.53	4.01	4.09		
w s w	4.03	4.11	4.19	4.27	4.35	4.44					
w *by* s	5.00	5.09	5.17	5.26							
West.	6.00										
⊙ ſets	6.00	5.49	5.38	5.27	5.15	5.03	4.51	4.38	4.25	4.13	4.04

A Sun-Dial for the Latitude of 49 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.34	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21
s s w	1.09	1.07	1.04	1.02	0.59	0.56	0.53	0.51	0.48	0.45	0.43
sw *by* s	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.14	1.11	1.08
s w	2.28	2.23	2.18	2.12	2.07	2.01	1.56	1.50	1.44	1.39	1.35
swbyw	3.14	3.07	3.01	2.54	2.48	2.41	2.34	2.27	2.19	2.13	2.08
w s w	4.05	3.57	3.50	3.42	3.34	3.26	3.18	3.09	3.00	2.53	2.47
w *by* s	5.01	4.53	4.44	4.36	4.27	4.18	4.09	4.00	3.50	3.42	3.35
West.	6.00	5.51	5.42	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31
w *by* n				6.34	6.25	6.16	6.07	5.58	5.48	5.40	5.33
w n w							7.08	7.00	6.51	6.43	6.38
nw *bw*										7.45	7.40
⊙ sets	6.00	6.11	6.23	6.35	6.47	6.59	7.12	7.25	7.39	7.51	8.00
Sun's Amp.	d. m 0.00	d. m 3.48	d. m 7.38	d. m 11.28	d. m 15.21	d. m 19.15	d. m 23.14	d. m 27.17	d. m 31.25	d. m 34.48	d. m 37.26

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.34	0.35	0.37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47
s s w	1.09	1.12	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.35
sw *by* s	1.47	1.51	1.55	1.59	2.03	2.07	2.11	2.15	2.20	2.23	2.26
s w	2.28	2.33	2.39	2.44	2.49	2.55	3.00	3.06	3.12	3.17	3.21
swbyw	3.14	3.20	3.27	3.34	3.40	3.47	3.54	4.01	4.09		
w s w	4.05	4.13	4.20	4.28	4.36	4.44					
w *by* s	5.01	5.09	5.18								
West.	6.00										
⊙ sets	6.00	5.49	5.37	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.00

A Sun-Dial for the Latitude of 50 Degrees.

North Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Point.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22
s s w	1.10	1.08	1.05	1.03	1.00	0.58	0.55	0.52	0.49	0.47	0.45
sw *by* s	1.48	1.45	1.41	1.37	1.33	1.29	1.25	1.21	1.16	1.13	1.10
s w	2.30	2.25	2.20	2.15	2.09	2.04	1.58	1.53	1.47	1.42	1.38
sw *by* w	3.16	3.09	3.03	2.56	2.50	2.43	2.36	2.30	2.23	2.16	2.12
w s w	4.06	3.59	3.51	3.44	3.36	3.29	3.21	3.13	3.04	2.57	2.51
w *by* s	5.02	4.54	4.45	4.37	4.29	4.20	4.12	4.03	3.53	3.45	3.39
West.	6.00	5.52	5.43	5.34	5.26	5.17	5.08	4.59	4.49	4.41	4.34
w *by* n				6.34	6.25	6.17	6.08	5.59	5.49	5.42	5.36
w n w							7.08	7.00	6.51	6.44	6.39
nw *bw*										7.45	7.41
⊙ sets	6.00	6.12	6.24	6.36	6.49	7.01	7.14	7.28	7.43	7.55	8.05
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	3.53	7.48	11.43	15.40	19.40	23.44	27.53	32.9	35.42	38.20

South Declination.

Deg.	o d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.35	0.36	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46	0.47
s s w	1.10	1.13	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.36
sw *by* s	1.48	1.52	1.56	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.27
s w	2.30	2.35	2.40	2.45	2.50	2.56	3.01	3.07	3.13	3.17	3.21
sw *by* w	3.16	3.22	3.28	3.35	3.41	3.48	3.55	4.02	4.09		
w s w	4.06	4.14	4.21	4.29	4.36	4.44					
w *by* s	5.02	5.10	5.18								
West.	6.00										
⊙ sets	6.00	5.48	5.36	5.24	5.11	4.59	4.46	4.32	4.17	4.05	3.55

A Sun-Dial for the Latitude of 51 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.23
s s w	1.11	1.09	1.06	1.04	1.01	0.59	0.56	0.53	0.51	0.48	0.47
sw *by* s	1.50	1.46	1.42	1.39	1.35	1.31	1.27	1.23	1.19	1.15	1.12
s w	2.31	2.26	2.21	2.16	2.11	2.06	2.01	1.55	1.50	1.45	1.41
sw*by*w	3.17	3.11	3.05	2.59	2.52	2.46	2.39	2.33	2.26	2.20	2.15
w s w	4.08	4.01	3.53	3.46	3.39	3.31	3.24	3.16	3.07	3.01	2.55
w *by* s	5.03	4.55	4.47	4.39	4.31	4.22	4.14	4.05	3.56	3.49	3.43
West.	6.00	5.52	5.44	5.35	5.27	5.18	5.10	5.01	4.51	4.44	4.37
w *by* n				6.34	6.26	6.17	6.09	6.00	5.51	5.44	5.38
w n w							7.08	7.00	6.52	6.45	6.40
nw*bw*										7.45	7.41
☉ sets	6.00	6.13	6.25	6.38	6.50	7.03	7.17	7.32	7.47	8.00	8.10
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	3.58	7.58	11.58	16.1	20.8	24.17	28.33	32.55	36.32	39.20

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.35	0.36	0.38	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.48
s s w	1.11	1.14	1.16	1.19	1.21	1.24	1.27	1.29	1.32	1.34	1.36
sw *by* s	1.50	1.53	1.57	2.01	2.05	2.09	2.13	2.17	2.21	2.24	2.27
s w	2.21	2.36	2.41	2.46	2.52	2.57	3.02	3.07	3.13	3.18	3.21
sw*by*w	3.17	3.23	3.30	3.36	3.42	3.49	3.55	4.02	4.09		
w s w	4.08	4.15	4.22	4.29	4.37	4.44					
w *by* s	5.03	5.10	5.18								
West.	6.00										
☉ sets	6.00	5.47	5.35	5.22	5.10	4.57	4.43	4.28	4.13	4.00	3.50

A Sun-Dial for the Latitude of 52 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.36	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.27	0.24
s s w	1.12	1.10	1.08	1.05	1.03	1.00	0.57	0.55	0.52	0.50	0.48
sw *by* s	1.51	1.47	1.44	1.40	1.36	1.33	1.29	1.25	1.21	1.17	1.15
s w	2.33	2.28	2.23	2.18	2.13	2.08	2.03	1.58	1.52	1.48	1.44
sw *by* w	3.19	3.13	3.07	3.01	2.55	2.48	2.42	2.36	2.29	2.24	2.19
w s w	4.09	4.02	3.55	3.48	3.41	3.34	3.26	3.19	3.11	3.04	2.59
w *by* s	5.03	4.56	4.48	4.40	4.33	4.25	4.16	4.08	3.59	3.52	3.46
West.	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.40
w *by* n				6.33	6.26	6.18	6.10	6.01	5.53	5.45	5.40
w n w							7.08	7.00	6.53	6.46	6.41
nw *bw*										7.45	7.40
⊙ ſets	6.00	6.13	6.26	6.39	6.52	7.06	7.20	7.35	7.51	8.05	8.16
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	4.03	8.08	12.14	16.23	20.40	24.51	29.14	33.46	37.29	40.21

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48
s s w	1.12	1.15	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.37
sw *by* s	1.51	1.55	1.58	2.02	2.06	2.10	2.13	2.17	2.22	2.25	2.28
s w	2.33	2.38	2.43	2.48	2.53	2.58	3.03	3.08	3.13	3.18	3.22
sw *by* w	3.19	3.25	3.31	3.37	3.43	3.49	3.56	4.02	4.10		
w s w	4.09	4.16	4.23	4.30	4.37	4.44					
w *by* s	5.03	5.11	5.19								
West.	6.00										
⊙ ſets	6.00	5.47	5.34	5.21	5.08	4.54	4.40	4.25	4.09	3.55	3.44

A Sun-Dial for the Latitude of 53 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24
s s w	1.13	1.11	1.08	1.05	1.04	1.01	0.59	0.56	0.53	0.51	0.50
sw *by* s	1.52	1.49	1.45	1.41	1.38	1.34	1.31	1.27	1.23	1.19	1.17
s w	2.34	2.30	2.25	2.20	2.15	2.10	2.05	2.00	1.55	1.51	1.47
sw *by* w	3.20	3.15	3.09	3.03	2.57	2.51	2.45	2.38	2.32	2.26	2.22
w s w	4.10	4.04	3.57	3.50	3.43	3.36	3.29	3.22	3.14	3.08	3.03
w *by* s	5.04	4.57	4.49	4.42	4.34	4.27	4.19	4.11	4.02	3.55	3.50
West.	6.00	5.52	5.45	5.37	5.29	5.22	5.15	5.05	4.56	4.49	4.43
w *by* n				6.34	6.26	6.19	6.11	6.03	5.54	5.47	5.42
w n w							7.08	7.01	6.53	6.47	6.42
nw *bw*									7.51	7.46	7.43
⊙ sets	6.00	6.14	6.27	6.41	6.54	7.08	7.23	7.39	7.56	8.10	8.21
Sun's Amp.	d. m 0.00	d. m 4.09	d. m 8.19	d. m 12.3	d. m 16.46	d. m 21.5	d. m 25.28	d. m 29.59	d. m 34.39	d. m 38.31	d. m 41.29

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48
s s w	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.37
sw *by* s	1.52	1.56	2.00	2.03	2.07	2.10	2.14	2.18	2.22	2.25	2.28
s w	2.34	2.39	2.44	2.49	2.54	2.58	3.03	3.09	3.14	3.18	3.22
sw *by* w	3.20	3.26	3.32	3.38	3.44	3.50	3.56	4.02			
w s w	4.10	4.17	4.24	4.30	4.37	4.44					
w *by* s	5.04	5.11	5.19								
West.	6.00										
⊙ sets	6.00	5.46	5.33	5.19	5.06	4.52	4.37	4.21	4.04	3.50	3.39

A Sun-Dial for the Latitude of 54 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
S by W	0.37	0.35	0.34	0.33	0.32	0.31	0.29	0.28	0.27	0.26	0.25
S S W	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53	0.51
SW by S	1.54	1.50	1.47	1.43	1.40	1.36	1.32	1.29	1.25	1.22	1.19
S W	2.36	2.31	2.27	2.22	2.17	2.12	2.08	2.03	1.57	1.53	1.50
W by W	3.22	3.16	3.01	3.05	2.59	2.53	2.47	2.41	2.35	2.29	2.25
W S W	4.12	4.05	3.59	3.52	3.45	3.39	3.32	3.24	3.17	3.11	3.06
W by S	5.05	4.58	4.51	4.43	4.36	4.29	4.21	4.13	4.05	3.58	3.53
West.	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46
W by N				6.34	6.27	6.19	6.12	6.04	5.56	5.49	5.44
W N W							7.09	7.01	6.54	6.48	6.43
N W by W									7.51	7.46	7.42
⊙ sets	6.00	6.14	6.28	6.42	6.56	7.11	7.27	7.43	8.00	8.15	8.27
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0.00	4.12	8.32	12.49	17.11	21.36	26.7	30.45	35.55	39.37	42.43

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
S by W	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48
S S W	1.14	1.16	1.19	1.21	1.24	1.26	1.28	1.31	1.33	1.35	1.37
SW by S	1.54	1.57	2.01	2.04	2.08	2.11	2.15	2.19	2.23	2.26	2.28
S W	2.36	2.41	2.45	2.50	2.54	2.59	3.04	3.06	3.15	3.19	3.22
SW by W	3.22	3.27	3.33	3.39	3.44	3.50	3.56	4.03			
W S W	4.12	4.18	4.24	4.31	4.38	4.45					
W by S	5.05	5.12	5.19								
West.	6.00										
⊙ sets	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33

A Sun-Dial for the Latitude of 55 Degrees.

North Declination.

Deg. / Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.37	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26
s s w	1.15	1.13	1.10	1.08	1.06	1.03	1.01	0.59	0.56	0.54	0.52
sw *by* s	1.55	1.51	1.48	1.45	1.41	1.38	1.34	1.30	1.27	1.23	1.21
s w	2.37	2.33	2.28	2.24	2.19	2.14	2.10	2.05	2.00	1.55	1.52
sw *by* w	3.23	3.18	3.12	3.07	3.01	2.56	2.50	2.44	2.38	2.33	2.29
w s w	4.13	4.06	4.00	3.54	3.47	3.41	3.34	3.27	3.20	3.14	3.10
w *by* s	5.06	4.59	4.52	4.45	4.38	4.31	4.23	4.16	4.08	4.02	3.56
West.	6.00	5.53	5 46	5.39	5.32	5.24	5.17	5.09	5.01	4.54	4.49
w *by* n					6.27	6.20	6.13	6.05	5.57	5.51	5.46
w n w							7.09	7.02	6.55	6.49	6.44
nw *bw*									7.51	7.46	7.42
⊙ sets	6.00	6.14	6.29	6.43	6.58	7.14	7.30	7.47	8.05	8.21	8.34
Sun's Amp.	d. m 0.00	d. m 4.21	d. m 8.45	d. m 13.9	d. m 17.37	d. m 22.10	d. m 26.49	d. m 31.42	d. m 6.36	d. m 40.46	d. m 44.2

South Declination.

Deg. / Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48
s s w	1.15	1.17	1.20	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.38
sw *by* s	1.55	1.58	2.01	2.05	2.08	2.12	2.16	2.19	2.23	2.26	2.29
s w	2.37	2.42	2.46	2.51	2.55	3.00	3.06	3.10	3.15	3.19	3.22
sw *by* w	3.23	3.29	3.34	3.40	3.45	3.51	3.57	4.03			
w s w	4.13	4.19	4.25	4.32	4.38	4.45					
w *by* s	5.06	5.12	5.19								
West.	6.00										
⊙ sets	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26

A Sun-Dial for the Latitude of 56 Degrees.

North Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,37	0,36	0,35	0,34	0,33	0,32	0,31	0,30	0,28	0,27	0,26
s s w	1,16	1,14	1,11	1,09	1,07	1,05	1,02	1,00	0,57	0,55	0,53
sw *by* s	1,56	1,53	1,49	1,46	1,43	1,39	1,26	1,32	1,28	1,26	1,23
s w	2,39	2,34	2,30	2,26	2,21	2,16	2,12	2,07	2,02	1,59	1,55
sw *by* w	3,25	3,19	3,14	3,09	3,03	2,58	2,52	2,46	2,40	2,36	2,32
w s w	4,14	4,08	4,02	3,56	3,50	3,43	3,37	3,30	3,23	3,17	3,13
w *by* s	5,06	5,00	4,53	4,46	4,40	4,33	4,26	4,14	4,11	4,05	4,00
West.	6,00	5,53	5,46	5,39	5,32	5,26	5,18	5,11	5,03	4,57	4,52
w *by* n				6,34	6,28	6,21	6,14	6,06	6,59	5,53	5,48
w n w						7,15	7,09	7,02	6,55	6,50	6,45
nw*by*w									7,51	7,46	7,43
⊙ sets	6,00	6,15	6,30	6,45	7,00	7,16	7,34	7,52	8,10	8,27	8,41
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	4,28	8,58	3,29	18,6	22.46	27.34	32.34	37.42	42,4	45.30

South Declination.

Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Min.											
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,37	0,39	0,40	0,41	0,42	0,43	0,44	0,45	0,47	0,48	0,48
s s w	1,16	1,18	1,20	1,22	1,25	1,27	1,29	1,32	1,34	1,36	1,38
sw *by* s	1,56	1,59	2,02	2,06	2,09	2,13	2,16	2,20	2,24	2,26	2,29
s w	2,39	2,43	2,47	2,52	2,57	3,01	3,06	3,10	3,15	3,19	
sw *by* w	3,25	3,30	3,35	3,40	3,46	3,51	3,57	4,03			
w s w	4,14	4,20	4,26	4,32	4,38						
w *by* s	5,06	5,13	5,19								
West.	6,00										
⊙ sets	6,00	5,45	5,30	5,15	5,00	4,44	4,26	4,08	3,50	3,33	3,19

A Sun-Dial for the Latitude of 57 Degrees.

North Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23 d
Min.		30m		30m		30m		30m			30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,38	0,37	0,36	0,35	0,34	0,32	0,31	0,30	0,29	0,28	0,27
s s w	1,17	1,14	1,12	1,10	1,08	1,06	1,04	1,01	0,59	0,57	0,55
sw *by* s	1,57	1,54	1,51	1,47	1,44	1,41	1,37	1,34	1,30	1,27	1,25
s w	2,40	2,36	2,32	2,24	2,23	2,18	2,14	2,10	2,05	2,01	2,58
sw *by*w	3,26	3,21	3,16	3,11	3,05	3,00	2,55	2,49	2,43	2,38	2,32
w s w	4,15	4,09	4,03	3,57	3,51	3,45	3,39	3,33	3,26	3,20	3,13
w *by* s	5,07	5,00	4,54	4,47	4,41	4,34	4,28	4,21	4,13	4,07	4,00
West.	6,00	5,53	5,47	5,40	5,33	5,27	5,20	5,13	5,05	4,59	4,52
w *by* n				6,34	6,28	6,21	6,14	6,07	6,00	5,54	5,47
w n w						7,15	7,09	7,03	6,56	6,51	6,44
nw *b* w									7,52	7,47	7,41
n w											8,37
⊙ ſets	6,00	6,16	6,31	6,47	7,03	7,20	7,38	7,56	8,16	8,34	8,47
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	4,35	9,12	13,49	18,26	22,54	28,22	32,21	38,53	43,27	47,0

South Declination.

Deg.	0 d	2 d	5 d	7 d	10 d	12 d	15 d	17 d	20 d	22 d	23
Min.		30m		30m		30m		30m			30
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,38	0,39	0,40	0,41	0,42	0,43	0,44	0,46	0,47	0,48	0,49
s s w	1,17	1,19	1,21	1,23	1,25	1,27	1,30	1,32	1,38	1,36	1,38
sw *by* s	1,57	2,00	2,03	2,07	2,10	2,13	2,17	2,20	2,24	2,27	2,30
s w	2,40	2,44	2,48	2,53	2,57	3,02	3,06	3,10	3,15	3,19	
sw *by*w	3,20	3,31	3,26	3,41	3,46	3,53	3,57	4,03			
w s w	4,15	4,21	4,26	4,32	4,38						
w *by* s	5,07	5,13	5,19								
West.	6,00										
⊙ ſets	6,00	6,44	6,29	5,13	4,57	4,40	4,22	4,04	3,44	3,26	3,1

A Sun-Dial for the Latitude of 58 *Degrees.*

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,38	0,37	0,36	0,35	0,34	0,33	0,32	0,31	0,30	0,29	0,28
s s w	1,17	1,15	1,13	1,11	1,09	1,07	1,05	1,02	1,00	0,58	0,57
sw *by* s	1,58	1,55	1,52	1,49	1,46	1,42	1,39	1,35	1,32	1,29	1,27
s w	2,41	2,37	2,33	2,29	2,25	2,21	2,16	2,12	2,07	2,04	2,01
sw *by* w	3,27	3,22	3,17	3,12	3,07	3,02	2,57	2,51	2,46	2,41	2,38
w s w	4,16	4,10	4,05	3,59	3,53	3,47	3,41	3,55	3,29	3,23	3,19
w *by* s	5,07	5,01	4,55	4,49	4,43	4,36	4,30	4,23	4,16	4,10	4,16
West.	6,00	5,54	5,47	5,41	5,35	5,28	5,21	5,15	5,08	5,02	4,57
w *by* n				6,34	6,28	6,22	6,15	6 08	6,02	5,56	5,51
w n w						7,16	7,10	7,03	6,57	6,52	6,48
nw*by*w								7,57	7,52	7,47	7,44
n w											8,38
⊙ sets	6,00	6,16	6,32	6,49	7,06	7,24	7,42	8,01	8,22	8,41	8,56
Sun's Amp.	d. m 0,00	d. m 4,43	d. m 9,28	d. m 14.16	d. m 19,8	d. m 24,6	d. m 29.14	d. m 34.34	d. m 40.12	d. m 44.59	d. m 48.49

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,38	0,39	0,40	0,41	0,43	0,44	0,45	0,46	0,47	0,48	0,49
s s w	1,17	1,19	1,22	1,24	1,26	1,28	1,30	1,32	1,35	1,37	1,38
sw *by* s	1,58	2,01	2,04	2,07	2,10	2,14	2,17	2,21	2,24	2,27	2,29
s w	2,47	2,45	2,49	2,53	2,57	3,02	3,06	3,10	2,15	3,19	
sw*by*w	3,22	3,32	3,37	3,42	3,47	3,52	3,57				
w s w	4,16	4,21	4,27	4,33	4,38						
w *by* s	5,07	5,13	5,19								
West.	6,00										
⊙ sets	6,00	5,44	5,28	5,11	4,54	4,36	4,18	3,59	3,38	3,19	3,04

A Sun-Dial for the Latitude of 59 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,39	0,38	0,37	0,36	0,35	0,34	0,32	0,31	0,30	0,29	0,29
s s w	1,18	1,16	1,14	1,12	1,10	1,08	1,06	1,04	1,01	1,00	0,58
sw *by* s	1,59	1,56	1,53	1,50	1,47	1,44	1,41	1,38	1,34	1,31	1,29
s w	2,42	2,38	2,35	2,31	2,27	2,23	2,19	2,14	2,10	2,06	2,03
sw *by* w	3,28	3,24	3,19	3,14	3,09	3,04	2,59	2,54	2,49	2,44	2,41
w s w	4,17	4,11	4,06	4,01	3,55	3,49	3,43	3,38	3,32	3,26	3,22
w *by* s	5,08	5,02	4,56	4,50	4,44	4,38	4,32	4,25	4,19	4,13	4,09
West.	6,00	5,54	5,48	5,42	5,36	5,29	5,23	5,16	5,09	5,04	4,59
w *by* n				6,35	6,29	6,22	6,16	6,10	6,03	5,58	5,53
w n w						7,16	7,10	7,04	6,58	6,53	6,48
nw *b* w								7,57	7,52	7,48	7,44
n w										8,43	8,38
⊙ sets	6,00	6.16	6,33	6,50	7,08	7,27	7,46	8,07	8,29	8,49	9,05
Sun's Amp.	d. m 0,00	d. m 4,51	d. m 9,45	d. m 14.41	d. m 19.42	d. m 24.51	d. m 30.10	d. m 35.42	d. m 42.37	d. m 46.20	d. m 50.44

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,39	0,40	0,41	0,42	0,43	0,44	0,45	0,46	0,47	0,48	0,49
s s w	1,18	1,20	1,22	1,24	1,26	1,28	1,31	1,33	1,35	1,37	1,38
sw *by* s	1,59	2,02	2,05	2,08	2,11	2,14	2,18	2,21	2,24	2,27	2,29
s w	2,42	2,46	2,50	2,54	2,58	3,02	3,06	3,11	3,15		
sw *by* w	3,28	3,33	3,38	3,43	3,47	3,52	3,57				
w s w	4,17	4,22	4,28	4,33	4,39						
w *by* s	5,08	5,14	5,19								
West.	6,00										
⊙ sets	6,00	5,44	5.27	5,10	4,52	4,33	4,14	3,53	3,31	3,11	2,51

A Sun-Dial for the Latitude of 60 Degrees.

North Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,39	0,38	0,37	0,36	0,35	0,34	0,33	0,32	0,31	0,30	0,29
s s w	1,19	1,17	1,15	1,13	1,11	1,09	1,07	1,05	1,03	1,01	1,00
sw *by* s	2,00	1,57	1,54	1,51	1,48	1,45	1,42	1,39	1,36	1,33	1,31
s w	2,44	2,40	2,36	2,33	2,28	2,24	2,20	2,16	2,12	2,08	2,06
sw *by* w	3,29	3,25	3,20	3,16	3,11	3,06	3,01	2,56	2,51	2,47	2,44
w s w	4,18	4,13	4,07	4,02	3,57	3,51	3,46	3,40	3,34	3,29	3,25
w *by* s	5,08	5,03	4,57	4,51	4,45	4,40	4,34	4,27	4,21	4,16	4,12
West.	6,00	5,54	5,48	5,42	5,36	5,31	5,24	5,18	5,11	5,06	5,02
w *by* n				6,35	6,29	6,23	6,17	6,11	6,04	5,59	5,55
w n w						7,16	7,10	7,04	6,59	6,54	6,50
nw *by* w								7,57	7,52	7,48	7,45
n w										8,41	8,39
⊙ sets	6,00	6,17	6,35	6,53	7,11	7,30	7,51	8,13	8,36	8,58	9,15
Sun's	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m	d. m
Amp.	0,00	5,00	10,2	15,5	20.19	25.39	31.10	36.48	43. 0	48.32	52.53

South Declination.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 30m
Points	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South.	12	12	12	12	12	12	12	12	12	12	12
s *by* w	0,39	0,40	0,41	0,42	0,43	0,44	0,45	0,46	0,47	0,48	0,49
s s w	1,19	1,21	1,23	1,25	1,27	1,29	1,31	1,33	1,35	1,37	1,38
sw *by* s	2,00	2,03	2,06	2,09	2,12	2,15	2,18	2,21	2,24	2,27	2,29
s w	2,44	2,47	2,51	2,55	2,59	3,03	3,07	3,11	3,15		
sw *by* w	3,29	3,34	3,39	3,43	3,48	3,53	3,58				
w s w	4,18	4,23	4,28	4,33	4,39						
w *by* s	5,08	5,14	5,20								
West.	6,00										
⊙ sets	6,00	5,43	5,25	5,07	4,49	4,30	4,09	3,47	3,24	3,02	2,45

The *Deſcription* and *Uſe* of the Foregoing Tables.

THeſe Tables are tituled at the head of each Page thus; A Sun-Dial for the Latitude of 0 Degree; the next is, A Sun-Dial for the Latitude of 1 Degree; and ſo on orderly unto 61 Degrees, making in all 61 Dials.

Each Dial hath two Tables, (the uppermoſt for North-Declination, the lowermoſt for South-Declination;) and 12 Columns in each Table: at the Head of each Column, and right aagainſt Deg. Min. you have the Degrees of Declination, thus |0 d|2 d 30 m|5 d|7 d 30 m|10 d|12 d 30 m|15 d|17 d 30 m|20 d|22 d|23 d 30 m|: d ſtanding for Degree, and m for Minute.

Under thoſe Degrees and Minutes of Declination in each Column is ſet, |h m|; h ſtands for Hour, and m for Minute of an Hour.

In the left-hand Column of each Table, under Point (at the Head) is the Points of the Compaſs, thus South; S. by W. S. S. W. S. W. by S. S. W. &c. S. by W. ſtanding for South and by Weſt; S. S. W. for South-South Weſt; S. W. by S. for South-Weſt by South, and ſo for the reſt.

In this Impreſſion is added at the Foot of each Table, the Sun's-ſetting and Amplitude, agreeable

thoſe ſeveral Declinations at the Head of each Column, and are diſtinguiſhed from the reſt by the Words in the left-hand Column, thus; Sun-Sets; Sun's-Amplitude; or ſo much of them as the Column can contain.

Note; The Sun's-Setting is annexed to each Table; but the Amplitude only to that for North-Declination, becauſe it is the ſame (for quantity) for South.

The Setting is Hours and minutes, but the Amplitude is Degrees and minutes, having (d) over the Degrees, and (m) over the Minutes.

By theſe Tables being Sun-Dials for all Latitudes, you may know the time of the Day, the Sun being viſible in any part of your Hemiſphere, as true and exact, as tho he were upon your Meridian; alſo his Riſing, Setting and Amplitude. The like may be known by any Star, whoſe Declination doth not exceed 23 d. 30 m. as will be evident by the following Propoſition.

Propoſition 1.

THe Latitude of the Place, the Declination, and Bearing of the Sun given; to find the Hour of the Day.

Note; By Bearing, is meant the Azimuth, or Point of the Compaſs he is upon; and that is found by ſetting the Sun with an Azimuth-Compaſs: which is the trueſt way.

The Reſolution of this Propoſition, is thus;

1. Seek the *Sun-Dial* for the given *Latitude*.

2. At the head of the *Table* (proper for the Declination) ſeek the given *Declination*, or the neareſt to it.

3. Find the Given, bearing among the *Points of the Compaſs* in the left-hand *Column*.

4. Then look ſtreight to the right-hand of the Bearing, till you come right under the *Declination*, (before found in the Head of the Table;) and what number you find there, is the Hour required.

Example 1.

In the Latitude of 30 *d.* the Sun having 15 *d.* North-Declination; I deſire to know at what a Clock the Sun cometh upon the S. W. Point of the Compaſs?

Look for the *Table* that belongeth to the *Latitude* of 30 *d.* in the head of the *Table*, and for 15 *d.* in the *Column of North Declination*, and for S. W. on the left-hand of the *Table*, and in the common Angle of meeting, I find the hour of the Day to be 0 h. 58 m. that is, 58 m. paſt 12 a Clock; which is the time required.

Example 2.

I deſire to know at what a Clock the Sun cometh to the South-Weſt as aforeſaid, and in the Latitude of 30 *d.* as aforeſaid, the Sun having 15 *d.* 0 m. South-Declination? *Anſwer*, 34 *m.* paſt 2 a Clock.

For if you turn to the *Dial* for *Latitude* 30 *Degrees*, and in the *Table* for *South-Declination*, ſeek 15 d. at the Head of it, under which, and againſt S. W. (on the

the left-hand) you will find 2 h. 34 min. the time of the Day required.

If your *Declination* be not the ſame with the *Declination* in the head of the *Table*, then you muſt look under that *Declination* in the head of the Table that is neareſt to the Declination propoſed:

But more exactly thus; Find the *Hour for the next Declination both leſſer and greater than the Declination propoſed*, and take the Difference of thoſe *Hours*, as alſo of the *Declinations* belonging to them; then ſay,

As the laſt Difference is to the firſt Difference, ſo is the Difference between the Declination propoſed, and the next leſſer in the Table, to a fourth proportional, which add to (*when the Hour in the Table increaſeth*) or (*when it decreaſeth*) ſubtract from the Hour belonging to the leſſer Declination aforeſaid: ſo you'l have the hour required exact to the Declination propoſed.

Example 3.

Admit the Declination to be 18 *d.* 20 *m.* North, I deſire to know at what a Clock the Sun cometh upon the W. S. W. Point of the Compaſs, in the Latitude of 30 deg.

I look in the head of the *Table*, and I find that the neareſt number to 18 d. 20 m. is 17 d. 30 m. I look under 17 d. 30 m. and againſt W. S. W. I find 1 h. 42 m. which ſheweth, that the Sun cometh upon the W. S. W. *Point of the Compaſs*, at 42 m. paſt 1 a Clock.

Now becauſe the *Declination* propoſed, and the *Declination* in the head of the *Table*, are ſomewhat

differing; therefore you may make a Proportion, the which you may eaſily gueſs at, as under 17 d. 30 m. and againſt W. S. W. you find 1 h. 42 m. and under 20 d. 0 m. you find 1 d. 25 m. the difference between theſe two Numbers is 17 m. And the difference between the Declinations 17 d. 30 m. and 20 d. is 2 d. 30 m. or 150 m. Alſo the difference between the Declinations 18 d. 20 m. and 17 d. 30 m. is 50 m. Then ſay; As 150 m. is to 17 min. ſo is 50 m to 6 m. almoſt: But becauſe 50 is $\frac{1}{3}$ of 150, therefore the third part of 17 m. is near 6 m. which muſt be ſubtracted from 1 h. 42 m. (becauſe the Hour decreaſeth) and the Remainder will be 1 h. 36 m. which is the true hour of the Day, the Sun being upon the W. S. W. point of the Compaſs, having 18 d. 20 m. North Declination. You may do the like with any other deg. and min. of Declination. But if your Declination be not much differing from that in the head of the Table, then you need not make any Proportion. Likewiſe, if the Sun be near the Meridian, you need not make any Proportion, becauſe there the difference is but ſmall.

Note; There is none but the Afternoon Points ſet down in the Tables of theſe Dials, but you may eaſily find the time of the Day for any of the Forenoon Points by the Table and what follows.

A Table of Points of the Compaſs equally diſtant from the Meridian.

Forenoon Points.	*Afternoon Points.*
South.	
S. by E.	S. by W.
S. S E.	S. S. W.
S. E. by S.	S. W. by S.
S. E.	S. W.
S. E. by E.	S. W. by W.
E. S. E.	W. S. W.
E. by S.	W. by S.
East.	West.
E. by N.	W. by N.
E. N. E.	W. N. W.
N. E. by E.	N. W. by W.
N. E.	N. W.
N. E. by N.	N. W. by N.
N. N. E.	N. N. W.
N. by E.	N. by W.
North.	
Forenoon Points.	*Afternoon Points.*

For this is an undoubted truth, That Points of the Compaſs equally diſtant from the Meridian, are alſo equal Time from Noon; ſo that at what ſpace of Time from Noon the Sun is S. E. in the Forenoon; the like ſpace of Time from Noon, he is S. W. after Noon.

In this laſt Table, all thoſe Points that ſtand right againſt one another, are equally diſtant from the Meridian; therefore to find the hour of the Day, the Sun being upon any of the *Forenoon-Points*, you muſt firſt ſee what time of the day it is when the Sun is upon the *Afternoon-Point* that ſtands right againſt your *Forenoon-Point* deſired: then ſubtract thoſe Hours and Minutes ſo found, from 12 Hours, and the Remainder is the Hour and Minute of the Day that you look after.

Example 4. In the Latitude of 60 degrees, the Sun being upon the N.E. Point of the Compaſs, I demand the hour of the Day, the Sun having 22 degrees North Declination?

Firſt, In the Sun-Dial for Latitude of 60 degrees, I look againſt N. W. which is the *Afternoon-Point*, correſpondent to N. E. my *Forenoon-Point*, and finding my *Declination* 22 degrees in the head of the *Table*, in the common Angle of meeting I find 8 hours 41 min. which being ſubtracted from 12 hours, the Remainder will be 5 hours 19 min. which is the hour of the Day deſired.

Example 5. The Sun being at E. N. E. in the ſame Latitude with the ſame Declination, I demand the hour of the Day?

In Latitude 60 Degrees, and North Declination 22 d. the Sun being at W. N. W. it is 54 min. paſt 6 a Clock in the Afternoon; which ſubtract from 12 hours, and the Remainder is 6 minutes paſt 5 in the morning; which is the time deſired.

Example 6. In the Latitude of 35 *d.* the Sun having

15

15 *d.* North-Declination, the Sun being upon the S. E. by E. Point of the Compaſs; I demand the hour and minute of the Day?

First; *In the Table for Latitude* 35 *degrees*, I look againſt S. W. by W. which is the *Afternoon-Point* correſpondent to S. E. by E. my *Forenoon-Point*. And finding my *Declination* 15 d. in the head of the *Table*, in the common Angle of meeting I find 1 h. 45 m. which deducted from 12 hours, the Remainder will be 15 m. paſt 10 a Clock, which is the true time of the Day deſired.

Example 7. In the Latitude of 35 *d.* North, the Sun having 15 *d.* South-Declination, and being upon the S. E. by E. Point of the Compaſs; I demand the hour of the Day?

Anſwer, 20 m. paſt 8 a Clock; for the Hour in the Table is 3 h. 40 m. which ſubtracted from 12 h. leaveth 8 h. 20 m. the hour required.

The like is to be underſtood in any other *Latitude*, with any other *Declination*, and with any other Point.

Note; Theſe Tables ſerve as well in South-Latitude as in North, only the Difference will be this:

If the *Latitude* be contrary, then the *Declination* muſt be contrary, and the *Points of the Compaſs* muſt be contrary; that is to ſay, your *North-Declination* muſt be South, and your *South-Declination* muſt be North; and South muſt be North, and S. by W. muſt be N. by W. and S. S. W. muſt be N. N. W. and S. W. by S. muſt be N. W. by N. and ſo you muſt reckon for any other Point, as you may plainly ſee in this following Table.

A Table of Points equally diſtant from Noon, both in North and South Latitude; either before or after Noon.

North Latitude.		South Latitude.	
Forenoon.	*Afternoon.*	*Forenoon.*	*Afternoon.*
South.	South.	North.	North.
S. by E.	S. by W.	N. by E.	N. by W.
S. S. E.	S. S. W.	N. N. E.	N. N. W.
S. E. by S.	S. W. by S.	N. E. by N.	N. W. by N.
S. E.	S. W.	N. E.	N. W.
S. E. by E.	S. W. by W.	N. E. by E.	N. W. by W.
E. S. E.	W. S. W.	E. N. E.	W. N. W.
E. by S.	W. by S.	E. by N.	W. by N.
East.	West.	East.	West.
E. by N.	W. by N.	E. by S.	W. by S.
E. N. E.	W. N. W.	E. S. E.	W. S. W.
N. E. by E.	N. W. by W.	S. E. by E.	S. W. by W.
N. E.	N. W.	S. E.	S. W.
N. E. by N.	N. W. by N.	S. E. by S.	S. W. by S.
N. N. E.	N. N. W.	S. S. E.	S. S. W.
N. by E.	N. by W.	S. by E.	S. by W.
North.			

To find the Hour of the Night by the Stars and the Tables of the Sun-Dial.

BY theſe Tables you may find the Hour of the Night, by the bearing of any known Star, whoſe-

whoſe Declination doth not exceed the Sun's greateſt Declination; which you may do after this manner.

First; Find the time of your known Star's coming to the Meridian on the Day propos'd; then if the Star be on the Eaſt-ſide of the Meridian, you muſt ſubtract thoſe Hours and Minutes which theſe Tables ſhew the Star to be diſtant from the Meridian, from the time of the Star's coming to the Meridian, and the Remainder is the true hour of the Night. But if your Star be on the Weſt-ſide of the Meridian, then you muſt add thoſe Hours and Minutes aforeſaid to the time of the Star's coming to the Meridian, as aforeſaid, and the Sum is the true hour of the Night.

To find a Star's coming on or to the Meridian, ſee the Sea-man's Kalendar in the Uſes of the Tables of the Sun's and Star's Right-Aſcenſion, pag. 91, 92, 93, *&c.*

Example 8.

Admit the *6th* day of *October*, I am in Latitude 40 d. 0 m. and I obſerve the *Bull's Eye* to be upon the S. E. Point of the Compaſs; I demand the hour of the Night?

The *6th* Day of *October* the *Bull's Eye* doth come on the Meridian at 45 minutes paſt 2 a Clock in the Morning; now this Star's Declination is 15 d. 48 m. North; therefore I look in the Table that belongs to 40 d. and in the head of the Table I find the Declination, and by the ſide the Point of the Compaſs correſpondent to my Bearing, and in the common Angle of meeting I find 1 hour 31 m. which is to be

be ſubtracted from 2 d. 45 m. which is the Star's Southing, and the Remainder is 1 h. 14 m. which is the hour of the Night deſired. But if this Star had born S. W. you muſt have added, and then you would have found the hour of the Night to have been 16 m. paſt 4 a Clock in the Morning.

The Operation.

	d. m.	
The time of the Star's being on the Meridian	2,45	morn.
His diſt. from the Mer. either at S. E. or S. W.	1,31	
The time of the Night, the Star being at S. E.	1,14	morn.
The time of the Night, the Star being at S.W.	4,16	morn.

Example 9.

Admit the 5*th* Day of *November*, I am in Latitude 45 d. 0 m. and I ſee the *Lion's Tail* to be upon the E. S. E. Point of the Compaſs, having Declination 16 d. 25 m. North; I demand the Hour of the Night?

	ho. m.	
The time of this Star's being on the Merid.	08 09	mor.
His diſtance from the Meridian	03 00	
The time of the Night, the Star being at E. S. E.	05 09	mor.
At W. S. W.	11 09	mor.

But note; If the Compaſs hath Variation, you muſt allow for the Variation; and if you will uſe this following

lowing Inſtrument, which I call a Rectifier, you need put your ſelf to that trouble, as to reckon which way the Variation is, either Eaſtward or Weſtward; as formerly all Men have done: but this following Inſtrument will do that for you, and it will ſhew you every Point ſo plain, that you cannot be miſtaken, as I will plainly ſhew you in the following part of this Book, when I come to ſhew you how to find the Variation: but for the preſent I will only give you one Propoſition, and apply it upon the Rectifier, which is as followeth.

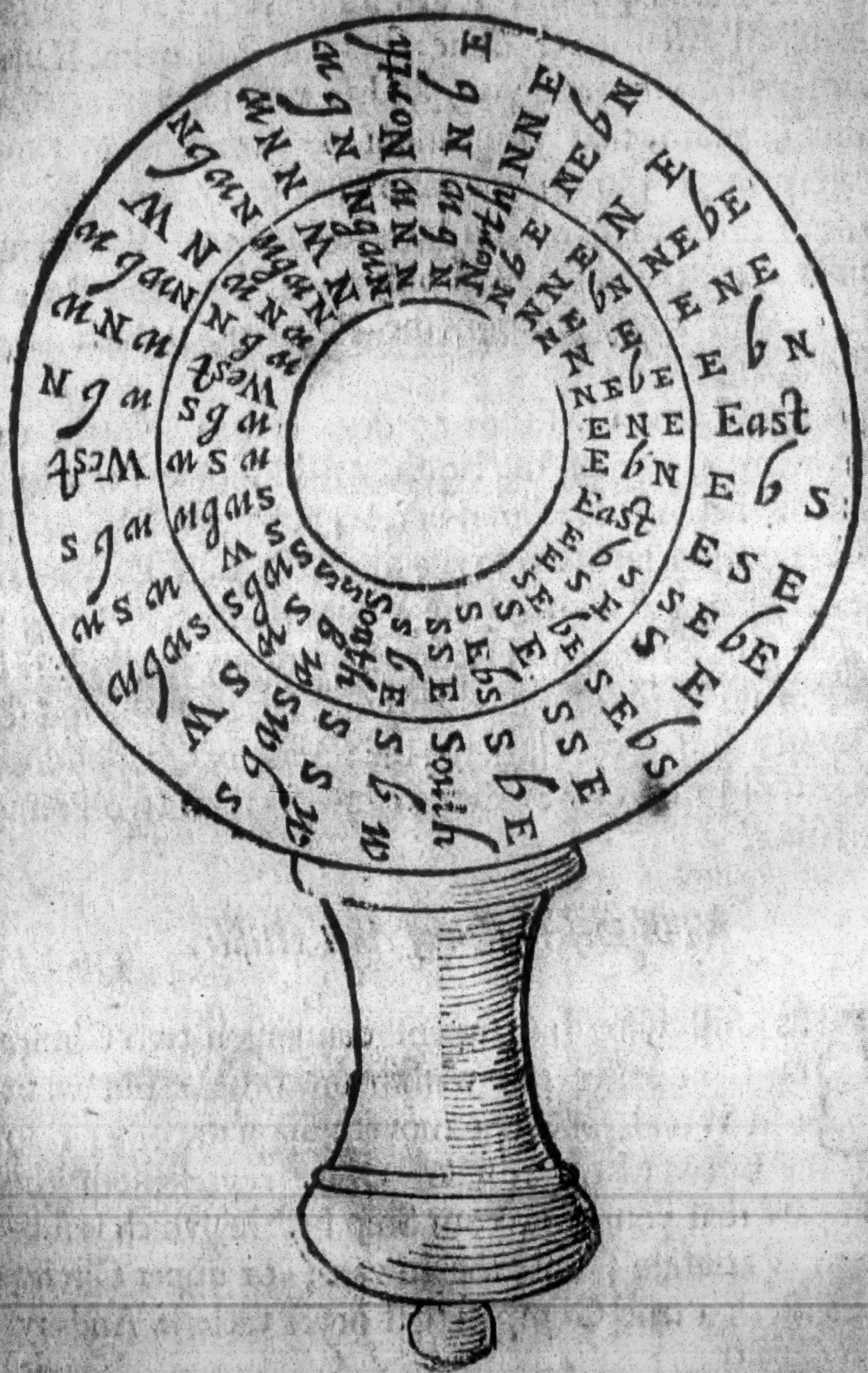
Admit I am in Latitude 47 deg. 0 min. North, the Sun being in one of the Equinoctial Points, (at which time he hath no Declination) I obſerve the Sun at his Riſing, and I find him to riſe upon the E. S. E. Point of the Compaſs; I demand the Variation?

The Sun having no Declination in any Latitude; if there be no Variation, the Sun will riſe at Eaſt, and ſet at Weſt; but according to the foregoing Propoſition, the Sun did riſe at E. S. E. therefore there is two Points Variation.

The Deſcription of the Rectifier.

THis following Inſtrument containeth two Circles or Compaſſes one within the other; but as it is made in Wood, the one moveth upon the other; ſo that the outward or under Circle repreſenteth the Compaſs that your ſteer your Ship by, the which is ſubject to Variation; but the inward, or upper Circle, repreſenteth a true Compaſs that never varieth. And by it

A RECTIFIER.



it you may very readily rectify your under-Compaſs, when it doth vary, which may be done thus:

Always bring the true Point of Riſing or Setting on the inward or upper Compaſs, to touch the falſe Point of Riſing or Setting on the outward or under Compaſs, and there let the Inſtrument ſtand.

As in this foregoing Propoſition: The Eaſt-Point is the true Point of Riſing, and the E.S.E. Point is the falſe Point of riſing; therefore bring the Eaſt-Point on the inward or upper Compaſs to touch the E. S. E. Point on the outward or under Compaſs, and there let it ſtand.

Thus the Points that are upon the inward Compaſs, do explain the Points that are upon the outward Compaſs: So that according to the foregoing Obſervation the N.N.E. Point on your Compaſs, is the true North Point; and the North Point on your Compaſs, is the true N.N.W. Point; and the N.W. Point on your Compaſs, is the true W.N.W. Point; and the Weſt Point on your Compaſs, is the true W.S.W. Point, as it plainly appears by the foregoing Figure.

Note; Your true Points are always on your inward Circle or Compaſs.

This Inſtrument in Wood, is a great deal larger than this Figure ſheweth it, and there the Points be divided into Halves and Quarters; as alſo each Compaſs (in ſome) is divided into 360 Degrees, numbred from the North, both ways towards the South, their ending in 180 Degrees.

To

To find the Sun's Riſing, Setting, or Amplitude, by the Tables of Sun-Dials.

IN the Table for the Latitude of the Place, ſeek the Declination, under which, and againſt ⊙ Sets, is his Setting; and againſt Sun's Amp. is the Amplitude; all which is ſo plain, it needs no Example.

Only obſerve if you ſubtract the Sun's Setting from 12 hours, it gives his Riſing.

ASTRONOMICAL TABLES

OF

Semidiurnal and *Seminoctturnal-Arches*;

SHEWING

The true Time of the Sun's Rising and Setting, with the Length of the Day and Night, for any Day in the Year: Fitting all Places in the World, whoſe Pole is not elevated above 60 Degrees, either North or South; and to laſt with Exactneſs, as long as God upholdeth the Courſe of Nature.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Degrees of Declination. Sun's	1 H.	1 M.	2 H.	2 M.	3 H.	3 M.	4 H.	4 M.	5 H.	5 M.	6 H.	6 M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	00	6	00	6	00	6	00	6	00	6	00
02	6	00	6	00	6	00	6	00	6	01	6	01
03	6	00	6	00	6	01	6	01	6	01	6	01
04	6	00	6	00	6	01	6	01	6	01	6	02
05	6	00	6	00	6	01	6	01	6	02	6	02
06	6	00	6	01	6	01	6	02	6	02	6	03
07	6	00	6	01	6	01	6	02	6	02	6	03
08	6	00	6	01	6	02	6	02	6	03	6	03
09	6	01	6	01	6	02	6	03	6	03	6	04
10	6	01	6	01	6	02	6	03	6	04	6	04
11	6	01	6	01	6	02	6	03	6	04	6	05
12	6	01	6	02	6	02	6	03	6	04	6	05
13	6	01	6	02	6	03	6	04	6	05	6	06
14	6	01	6	02	6	03	6	04	6	05	6	06
15	6	01	6	02	6	03	6	04	6	05	6	06
16	6	01	6	02	6	03	6	05	6	06	6	07
17	6	01	6	02	6	04	6	05	6	06	6	07
18	6	01	6	03	6	04	6	05	6	07	6	08
19	6	01	6	03	6	04	6	05	6	07	6	08
20	6	01	6	03	6	04	6	06	6	07	6	09
21	6	02	6	03	6	05	6	06	6	08	6	09
22	6	02	6	03	6	05	6	06	6	08	6	10
23	6	02	6	03	6	05	6	07	6	09	6	10
23,31	6	02	6	04	6	05	6	07	6	09	6	11

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Semidiurnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Sun's Declin.	7		8		9		10		11		12	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	00	6	00	6	01	6	01	6	01	6	01
02	6	01	6	01	6	01	6	01	6	02	6	02
03	6	01	6	02	6	02	6	02	6	02	6	03
04	6	02	6	02	6	02	6	03	6	03	6	03
05	6	02	6	03	6	03	6	04	6	04	6	04
06	6	03	6	03	6	04	6	04	6	05	6	05
07	6	03	6	04	6	04	6	05	6	05	6	06
08	6	04	6	04	6	05	6	06	6	06	6	07
09	6	04	6	05	6	06	6	06	6	07	6	08
10	6	05	6	06	6	06	6	07	6	08	6	09
11	6	05	6	06	6	07	6	08	6	09	6	09
12	6	06	6	07	6	08	6	09	6	09	6	10
13	6	06	6	07	6	08	6	09	6	10	6	11
14	6	07	6	08	6	09	6	10	6	11	6	12
15	6	08	6	09	6	10	6	11	6	12	6	13
16	6	08	6	09	6	10	6	12	6	13	6	14
17	6	09	6	10	6	11	6	12	6	14	6	15
18	6	09	6	10	6	12	6	13	6	14	6	16
19	6	10	6	11	6	13	6	14	6	15	6	17
20	6	10	6	12	6	14	6	15	6	16	6	18
21	6	11	6	12	6	14	6	16	6	17	6	19
22	6	11	6	13	6	15	6	16	6	18	6	20
23	6	12	6	14	6	15	6	17	6	19	6	21
23 31	6	12	6	14	6	16	6	18	6	19	6	22

Degrees of Declination.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

Sun's Degrees of Declination.	The Degrees of Latitude. 13		14		15		16		17		18	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	01	6	01	6	01	6	01	6	01	6	01
02	6	02	6	02	6	02	6	02	6	02	6	02
03	6	03	6	03	6	03	6	03	6	04	6	04
04	6	04	6	04	6	04	6	05	6	05	6	05
05	6	05	6	05	6	05	6	06	6	06	6	06
06	6	06	6	06	6	06	6	07	6	07	6	08
07	6	06	6	07	6	07	6	08	6	09	6	09
08	6	07	6	08	6	09	6	09	6	10	6	10
09	6	08	6	09	6	10	6	10	6	11	6	12
10	6	09	6	10	6	11	6	12	6	12	6	13
11	6	10	6	11	6	12	6	13	6	13	6	14
12	6	11	6	12	6	13	6	14	6	15	6	16
13	6	12	6	13	6	14	6	15	6	16	6	17
14	6	13	6	14	6	15	6	16	6	17	6	19
15	6	14	6	15	6	16	6	18	6	19	6	20
16	6	15	6	16	6	18	6	19	6	20	6	21
17	6	16	6	17	6	19	6	20	6	21	6	23
18	6	17	6	19	6	20	6	21	6	23	6	24
19	6	18	6	20	6	21	6	23	6	24	6	26
20	6	19	6	21	6	22	6	24	6	25	6	27
21	6	20	6	22	6	24	6	25	6	27	6	29
22	6	21	6	23	6	25	6	27	6	28	6	30
23	6	22	6	24	6	26	6	28	6	30	6	32
23,31	6	23	6	25	6	27	6	29	6	31	6	33

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

Sun's Decl.	The Degrees of Latitude. 19		20		21		22		23		24	
Degrees of Declination.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	01	6	01	6	01	6	02	6	02	6	02
02	6	03	6	03	6	03	6	03	6	03	6	03
03	6	04	6	04	6	05	6	05	6	05	6	05
04	6	05	6	06	6	06	6	06	6	07	6	07
05	6	07	6	07	6	08	6	08	6	09	6	09
06	6	08	6	09	6	09	6	10	6	10	6	11
07	6	10	6	10	6	11	6	11	6	12	6	13
08	6	11	6	12	6	12	6	13	6	14	6	14
09	6	13	6	13	6	14	6	15	6	15	6	16
10	6	14	6	15	6	16	6	16	6	17	6	18
11	6	15	6	16	6	17	6	18	6	19	6	20
12	6	17	6	18	6	19	6	20	6	21	6	22
13	6	18	6	19	6	20	6	21	6	23	6	24
14	6	20	6	21	6	22	6	23	6	24	6	25
15	6	21	6	22	6	24	6	25	6	26	6	27
16	6	23	6	24	6	25	6	27	6	28	6	29
17	6	24	6	25	6	27	6	28	6	30	6	31
18	6	26	6	27	6	29	6	30	6	32	6	33
19	6	27	6	29	6	30	6	32	6	34	6	35
20	6	28	6	30	6	32	6	34	6	36	6	37
21	6	30	6	32	6	34	6	36	6	37	6	39
22	6	31	6	33	6	35	6	37	6	39	6	41
23	6	33	6	35	6	37	6	39	6	41	6	43
23,31	6	34	6	36	6	38	6	40	6	43	6	45

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Sun's Declin.	25 H.	25 M.	26 H.	26 M.	27 H.	27 M.	28 H.	28 M.	29 H.	29 M.	30 H.	30 M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	02	6	02	6	02	6	02	6	02	6	02
02	6	04	6	04	6	04	6	04	6	04	6	05
03	6	06	6	06	6	06	6	06	6	07	6	07
04	6	07	6	08	6	08	6	09	6	09	6	09
05	6	09	6	10	6	10	6	11	6	11	6	12
06	6	11	6	12	6	12	6	13	6	13	6	14
07	6	13	6	14	6	14	6	15	6	16	6	16
08	6	15	6	16	6	16	6	17	6	18	6	19
09	6	17	6	18	6	19	6	19	6	20	6	21
10	6	19	6	20	6	21	6	22	6	23	6	23
11	6	21	6	22	6	23	6	24	6	25	6	26
12	6	23	6	24	6	25	6	26	6	27	6	28
13	6	25	6	26	6	27	6	28	6	29	6	31
14	6	27	6	28	6	29	6	30	6	22	6	33
15	6	29	6	30	6	31	6	33	6	34	6	36
16	6	31	6	32	6	34	6	35	6	37	6	38
17	6	33	6	34	6	36	6	37	6	39	6	41
18	6	35	6	36	6	38	6	40	6	42	6	43
19	6	37	6	39	6	40	6	42	6	44	6	46
20	6	39	6	41	6	43	6	45	6	47	6	48
21	6	41	6	43	6	45	6	47	6	49	6	51
22	6	43	6	45	6	48	6	50	6	52	6	54
23	6	46	6	48	6	50	6	52	6	54	6	57
23,31	6	47	6	49	6	51	6	53	6	56	6	59

Degrees of Declination.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

Sun's Decl.	The Degrees of Latitude. 31		32		33		34		35		36	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	02	6	02	6	03	6	03	6	03	6	03
02	6	05	6	05	6	05	6	05	6	06	6	06
03	6	07	6	08	6	08	6	08	6	08	6	09
04	6	10	6	10	6	10	6	11	6	11	6	12
05	6	12	6	13	6	13	6	14	6	14	6	15
06	6	15	6	15	6	16	6	16	6	17	6	18
07	6	17	6	18	6	18	6	19	6	20	6	20
08	6	19	6	20	6	21	6	22	6	23	6	23
09	6	22	6	23	6	24	6	25	6	25	6	26
10	6	24	6	25	6	26	6	27	6	28	6	29
11	6	27	6	28	6	29	6	30	6	31	6	32
12	6	29	6	31	6	32	6	33	6	34	6	36
13	6	32	6	33	6	34	6	36	6	37	6	39
14	6	34	6	36	6	37	6	39	6	40	6	42
15	6	37	6	39	6	40	6	42	6	43	6	45
16	6	40	6	41	6	43	6	45	6	46	6	48
17	6	42	6	44	6	46	6	48	6	49	6	51
18	6	45	6	47	6	49	6	51	6	53	6	55
19	6	48	6	50	6	52	6	54	6	56	6	58
20	6	51	6	53	6	55	6	57	6	59	7	01
21	6	53	6	56	6	58	7	00	7	02	7	05
22	6	56	6	58	7	01	7	03	7	06	7	08
23	6	59	7	01	7	04	7	06	7	09	7	12
23,31	7	01	7	03	7	06	7	08	7	11	7	14

Degrees of Declination.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Decl. Sun's	37		38		39		40		41		42	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	03	6	03	6	03	6	03	6	03	6	04
02	6	06	6	06	6	06	6	07	6	07	6	07
03	6	09	6	09	6	10	6	10	6	10	6	11
04	6	12	6	13	6	13	6	13	6	14	6	14
05	6	15	6	16	6	16	6	17	6	17	6	18
06	6	18	6	19	6	20	6	20	6	21	6	22
07	6	21	6	22	6	23	6	24	6	25	6	25
08	6	24	6	25	6	26	6	27	6	28	6	29
09	6	27	6	28	6	29	6	31	6	32	6	33
10	6	31	6	32	6	33	6	34	6	35	6	37
11	6	34	6	35	6	36	6	38	6	39	6	40
12	6	37	6	38	6	40	6	41	6	43	6	44
13	6	40	6	42	6	43	6	45	6	46	6	48
14	6	43	6	45	6	47	6	48	6	50	6	52
15	6	47	6	48	6	50	6	52	6	54	6	56
16	6	50	6	52	6	54	6	56	6	58	7	00
17	6	53	6	55	6	57	7	00	7	02	7	04
18	6	57	6	59	7	01	7	03	7	06	7	08
19	7	00	7	02	7	05	7	07	7	10	7	12
20	7	04	7	06	7	09	7	11	7	14	7	17
21	7	07	7	10	7	12	7	15	7	18	7	21
22	7	11	7	14	7	16	7	19	7	22	7	25
23	7	15	7	17	7	20	7	23	7	27	7	30
23,31	7	17	7	19	7	22	7	26	7	29	7	32

Degrees of Declination.

A Table ſhewing the Semidiurnal-Arch, or the Time of Sun-ſetting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-riſing, when the Sun hath South-Declination.

Sun's Decl.	The Degrees of Latitude. 43 H.	M.	44 H.	M	45 H.	M.	46 H.	M.	47 H.	M.	48 H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	04	6	04	6	04	6	04	6	04	6	04
02	6	07	6	08	6	08	6	08	6	09	6	09
03	6	11	6	12	6	12	6	12	6	13	6	13
04	6	15	6	15	6	16	6	17	6	17	6	18
05	6	19	6	19	6	20	6	21	6	22	6	22
06	6	22	6	23	6	24	6	25	6	26	6	27
07	6	26	6	27	6	28	6	29	6	30	6	31
08	6	30	6	31	6	32	6	33	6	35	6	36
09	6	34	6	35	6	36	6	38	6	39	6	41
10	6	38	6	39	6	41	6	42	6	44	6	45
11	6	42	6	43	6	45	6	46	6	48	6	50
12	6	46	6	47	6	49	6	51	6	53	6	55
13	6	50	6	52	6	53	6	55	6	57	6	59
14	6	54	6	56	6	58	7	00	7	02	7	04
15	6	58	7	00	7	02	7	04	7	07	7	09
16	7	02	7	04	7	07	7	09	7	12	7	14
17	7	06	7	09	7	11	7	14	7	17	7	19
18	7	11	7	13	7	16	7	19	7	22	7	25
19	7	15	7	18	7	21	7	24	7	27	7	30
20	7	19	7	22	7	25	7	29	7	32	7	35
21	7	24	7	27	7	30	7	34	7	37	7	41
22	7	28	7	31	7	35	7	39	7	43	7	47
23	7	33	7	37	7	40	7	44	7	48	7	53
23,31	7	36	7	39	7	43	7	47	7	51	7	56

Degrees of Declination.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Decl. Sun's	49		50		51		52		53		54	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	05	6	05	6	05	6	05	6	05	6	06
02	6	09	6	10	6	10	6	10	6	11	6	11
03	6	14	6	14	6	15	6	15	6	16	6	17
04	6	18	6	19	6	20	6	21	6	21	6	22
05	6	23	6	24	6	25	6	26	6	27	6	28
06	6	28	6	29	6	30	6	31	6	32	6	33
07	6	32	6	34	6	35	6	36	6	38	6	39
08	6	37	6	39	6	40	6	41	6	43	6	45
09	6	42	6	44	6	45	6	47	6	49	6	50
10	6	47	6	49	6	50	6	52	6	54	6	56
11	6	52	6	54	6	56	6	58	7	00	7	02
12	6	57	6	59	7	01	7	03	7	06	7	08
13	7	02	7	04	7	06	7	09	7	11	7	14
14	7	07	7	09	7	12	7	14	7	17	7	20
15	7	12	7	14	7	17	7	20	7	23	7	27
16	7	17	7	20	7	23	7	26	7	29	7	33
17	7	22	7	25	7	29	7	32	7	36	7	40
18	7	28	7	31	7	35	7	38	7	42	7	46
19	7	33	7	37	7	41	7	45	7	49	7	53
20	7	39	7	43	7	47	7	51	7	56	8	00
21	7	45	7	49	7	53	7	58	8	02	8	08
22	7	51	7	55	8	00	8	05	8	10	8	15
23	7	57	8	02	8	06	8	12	8	17	8	23
23,31	8	00	8	05	8	10	8	16	8	21	8	27

Degrees of Declination.

A Table shewing the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination; and the Seminocturnal-Arch, or the Time of Sun-rising, when the Sun hath South-Declination.

The Degrees of Latitude.

Sun's Decl.	55		56		57		58		59		60	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
00	6	00	6	00	6	00	6	00	6	00	6	00
01	6	06	6	06	6	06	6	06	6	07	6	07
02	6	11	6	12	6	12	6	13	6	13	6	14
03	6	17	6	18	6	19	6	19	6	20	6	21
04	6	23	6	24	6	25	6	26	6	27	6	28
05	6	29	6	30	6	31	6	32	6	33	6	35
06	6	35	6	36	6	37	6	39	6	40	6	42
07	6	40	6	42	6	44	6	45	6	47	6	49
08	6	46	6	48	6	50	6	52	6	54	6	56
09	6	52	6	54	6	56	6	59	6	01	7	04
10	6	58	7	00	7	03	7	06	7	08	7	11
11	7	04	7	07	7	10	7	13	7	16	7	19
12	7	11	7	13	7	16	7	20	7	23	7	26
13	7	17	7	20	7	23	7	27	7	30	7	34
14	7	23	7	27	7	30	7	34	7	38	7	42
15	7	30	7	34	7	38	7	42	7	46	7	51
16	7	37	7	41	7	45	7	49	7	54	7	59
17	7	44	7	48	7	52	7	57	8	03	8	08
18	7	51	7	55	8	00	8	05	8	11	8	17
19	7	58	8	03	8	08	8	14	8	20	8	26
20	8	05	8	10	8	16	8	22	8	29	8	36
21	8	13	8	19	8	25	8	32	8	39	8	47
22	8	21	8	27	8	34	8	41	8	49	8	58
23	8	29	8	36	8	43	8	51	9	00	9	09
23 31	8	34	8	41	8	48	8	56	9	05	9	15

Degrees of Declination.

The USE of the Foregoing Tables.

To find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, by these foregoing Tables of Semidiurnal and Seminocturnal-Arches.

FIrst, seek the Sun's Declination in the Tables of Declination for your Day proposed, with which enter the foregoing Table of Semidiurnal and Seminocturnal-Arches, finding the Elevation of the Pole, or Latitude of the Place, in the head of the Table, and the Degree of the Sun's Declination in the first Column on the left-hand; and in the common Angle of Meeting you will find the Semidiurnal-Arch, if the Sun hath North-Declination; or the Seminocturnal-Arch, if the Sun hath South-Declination.

Example 1.

For Illustration hereof, let it be required to find the Time of the Sun's Riling and Setting, with the Length of the Day and Night for the 23*d* day of *April* 1692, in Latitude 46 deg. North.

At which Time the Sun's Declination is 16 deg. 1 min. North, with which I enter the Table, as before is declared, and I find the Semidiurnal-Arch to be 7 hours 9 min. which is the true Time of Sun-ſetting, whoſe Complement to 12 Hours, is the Seminocturnal-Arch, or the Time of Sun-riſing, which is 4 hours 51 min. If you double the Semidiurnal-Arch, you will have the Length of the Day; and if you double the Seminocturnal-Arch, the Aggregate will yield you the Length of the Night: See the Work following.

	H.	M.
The Semidiurnal-Arch, or Time of Sun-ſetting	12	00
	07	09
The Complement to 12 Hours	04	51

Which is the Seminocturnal-Arch, or Time of Sun-riſing, Latitude 46 Degrees.

The Semidiurnal-Arch doubled	07	09
	07	09
The Length of the Day, *Apr.* 23. 1692.	14	18
The Seminocturnal-Arch doubled,	04	51
	04	51
The Length of the Night, *April* 23. 1692.	09	42

Example

Example 2.

But when the Sun hath 16 Deg. 1 Min. South-Declination in this Latitude of 46 Deg.

Then the Day-Arch will be equal to the Night-Arch, and the Night-Arch will be equal to the Day-Arch.

As on *October* 26. 1692. the Sun hath 16 deg. 2 min. South-Declination, then the Time of the Sun's rising will be at 7 hours 9 min. his Setting at 4 hours 51 min. the length of the Day will be 9 hours 42 min. and the length of the Night 14 hours 18 min.

Example 3.

Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 15*th* Day of *December* 1693. in Latitude 53 deg. North; at which Time the Sun's Declination is 23 deg. 27 min. South.

	H.	M.
The Seminocturnal-Arch, or the Time of Sun-rising	12	00
	08	21
The Complement to 12 hours	03	39
Which is the Semidiurnal-Arch, or Time of Sun-setting.		
The Semidiurnal-Arch doubled	03	39
	03	39
Length of the Day, *Dec.* 15. 1693.	07	18

	H.	M.
The Seminocturnal-Arch doubled,	08	21
	08	21
The Length of the Night, *Decemb.* 15, 1693.	16	42

These Tables will serve as well in South-Latitude, as they will in North, without any Alteration; only this is to be considered, When you are in South-Latitude, you must then use your South-Declination there, as you do your North-Declination here.

For then these Tables shew the Semidiurnal-Arch, or the Time of Sun-setting, when the Sun hath South-Declination; and the Seminocturnal-Arch, or the Time of Sun-setting, when the Sun hath North-Declination.

Example 4.

Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 23*d* Day of *April* 1692, in Latitude 16 deg. South.

At which Time the Sun's Declination is 16 deg. 1 min. North, with which I enter the Table, and I find the Seminocturnal-Arch to be 7 hours 9 min. which is the true Time of Sun-rising, whose Complement to 12 hours, is the Semidiurnal-Arch, or the Time of Sun-setting, which is at 51 min. past 4 of the Clock.

The

	H.	M.
The Seminocturnal-Arch doubled—	12	00
	07	09
	07	09
The Length of the Night, *April* 23. 1692. Latitude 46 deg. South—	14	18
The Semidiurnal-Arch doubled—	04	51
	04	51
The Length of the Day for the 23*d* of *April*, 1692. Latitude 46 deg. South,	09	42

Example 5.

Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night, for the 15*th* Day of *December*, 1693, in Latitude 53 deg. South.

At which Time, the Sun's Declination is 23 deg. 27 min. South; with which enter the Table of Semidiurnal-Arches, *&c.* and you will find as follows.

	H.	M.
The Semidiurnal-Arch, or Time of Sun-setting	12	00
	08	21

	Hr.	M.
The Seminocturnal Arch, or the Time of Sun Rising, ——	3	39
The Length of the Day,	16	42
Length of the Night, *Dec.* 15, 1693, Latitude 53 degrees *South.*	7	18

To find the time of a Star's Rising or Setting.

BY these Tables you may find the time of the *Rising* and *Setting* of all the *fixed Stars* in the Heavens, whose *Declinations* do not exceed the *Sun's greatest Declination*, in any *Latitude* that the Tables contain, and at any time of the Year, in this manner;

If the *Star* hath *North Declination*, and you in *North Latitude*, look for your *Latitude* in the head of the Table, the *Declination* on the left-hand; and in the common Angle of meeting, you will find your *Star's Semidiurnal Arch*, or half the time that *Star* doth continue above the *Horizon* in that *Latitude*; or the Distance of time that *Star* is in going from the *Horizon* to the *Meridian* on the Eastside; likewise from the *Meridian* to the *Horizon* on the West-side of the *Meridian*.

Now if you subtract these Hours and Minutes aforesaid, from the time of the *Star's* coming to the *Meridian*, the Remainder will be the time of the *Star's Rising*; and if you add, the Sum will be the true time of the *Star's Setting*.

Example 6.

Let it be required to find the time of the Riſing and Setting of the *Bull's-Eye*, *Novemb.* 18. in the Latitude of 42 deg. North; the Declination of this Star is 15 deg. 47 min. North; the 18*th* Day of *November*, this Star cometh on the Meridian at 12 a Clock at Night.

	H.	M.
The time of the Star's Southing ——	12	00
The Semidiurnal Arch, *ſubtract* ——	06	59
Time of the Star's Riſing in the Evening, ——	05	01
Time of the Star's Setting in the Morning, ——	06	59

Note, 1. If the Sum of your addition exceed 12 Hours, you muſt caſt away 12 Hours.

2. And when you can't ſubtract, add 12 Hours to the Star's Southing, and then ſubtract, what remains is its Setting.

Example 7.

I deſire to know the time of the Riſing and Setting of the *Bull's-Eye* the 18*th* Day of *November*, in the Latitude of 13 deg. North, the Declination of the *Bull's-Eye* is 15 deg. 47 min. North.

The

	H.	M.
The Time of its Southing	12	00
The Semidiurnal Arch, *ſubtract*	06	15
The time of his Riſing in the Evening	05	45
The time of his Setting in the Morning,	06	15

If your Star hath *South-Declination*, and you in *North-Latitude*, look as before the *Latitude* in the head of the Table, the *Declination* on the left ſide, and in the common Angle of meeting you will find the *Star's Seminocturnal Arch*, which ſubtract from 12 Hours, the Remainder is the *Star's Semidiurnal Arch* or half the time that *Star* doth continue above the *Horizon* in that *Latitude*: therefore if you ſubtract thoſe Hours and Minutes aboveſaid, from the time of the *Star's* coming to the *Meridian*, (adding 12 Hours to the Star's Southing, if otherwiſe Subtraction cannot be made) the Remainder will be the time of the *Star's Riſing*; and if you add, the Sum will be the time of the *Star's Setting*.

Example 8.

Let it be required to find the time of the Riſing and Setting of the bright Star in the *Great-Dog's Mouth*, the 15*th* Day of *November*, in the Latitude of 50 d. North. The Declination of the *Great-Dog's Mouth* is 16 d. 15 m. South.

	H.	M.
The time of this Star's Southing,	02	26
To it add	12	00
The Sum is	14	26
The Seminocturnal Arch, *by the Table, is*	07	21
Which subtract from	12	00
The Remainder is the Semidiurnal Arch	04	39
Time of Southing, with 12 Hours added, is	14	26
The Semidiurnal Arch, *subtract*	04	39
Time of the Star's Rising in the Evening,	09	47
Time of the Star's Setting in the Morning,	07	05

Example 9.

I desire to know the Rising and Setting of the *Great-Dog*, and for the 15*th* of *November*, as aforesaid, in the Latitude of 33 degrees North.

	H.	M.
Time of Southing, with 12 hours added	14	26
The Semidiurnal Arch,	05	22
Time of the Star's Rising in the Evening,	09	04
Time of the Star's Setting in the Morning,	07	48

In

In South-Latitude, to know the time of the Riſing and Setting of the Stars.

DO with thoſe *Stars* that have *North Declination*, in *South-Latitude*, as with Stars that have *South Declination*, when in *North-Latitude*.

Example 10.

To illuſtrate this; Let it be required to find the true time of Riſing and Setting of the *Bull's-Eye* the 18*th* Day of *November*, in the Latitude of 42 deg. South.

The Declination of this Star is 15 deg. 47 min. North; the 18*th* Day of *November* this Star cometh upon the Meridian at 12 of the Clock at Night.

	H.	M.
The Seminocturnal Arch, *by the Table, is* ——	06	59
Which ſubtract from —— —— —— ——	12	00
The Remainder is the Semidiurnal Arch, ——	05	01
The time of the Star's Northing is —— ——	12	00
The Semidiurnal Arch, *add* —— —— ——	05	01
Time of the Star's-Riſing in the Evening, ——	06	59
Time of the Star's-Setting in the Morning, ——	05	01

In like manner may the Rising and Setting of any Star, (whose Declination exceedeth not the Sun's greatest) be found in any Latitude, from the Equinoctial to 60 Degrees.

ASTRO-

ASTRONOMICAL

TABLES

SHEWING

The Point of the *Compaſs* that the *Sun* and *Stars* Riſe and Set with.

Being of excellent Uſe for the ready finding of the *Variation of the Compaſs*: and may be performed by an ordinary *Meridian-Compaſs*, but more exactly by an *Azimuth-Compaſs*.

Fitting all Parts of the World, where the Pole is elevated not above 60 *deg.* either *North* or *South*.

Latitude 0 Degree.

North Declination. ⊙rise.	North Declination. ⊙ set.	Declination. D. M.	South Declination. ⊙rise.	South Declination. ⊙ set.
East	West	0. 0	East	West
	1	2.49	1	
	2	5.37	2	
	3	8.26	3	
e by n	w by n	11.15	e by s	w by s
	1	14. 4	1	
	2	16.52	2	
	3	19.41	3	
e n e	w n w	22.30	e s e	w s w

Latitude 1 Degree.

North Declination. ⊙rise.	North Declination. ⊙ set.	Declination. D. M.	South Declination. ⊙rise.	South Declination. ⊙ set.
East	West	0. 0	East	West
	1	2.49	1	
	2	5.37	2	
	3	8.26	3	
e by n	w by n	11.15	s by s	w by s
	1	14. 4	1	
	2	16.52	2	
	3	19.41	3	
e n e	w n w	22.30	e s e	w s w

Latitude 2 Degrees.

North Declination. ⊙rise.	North Declination. ⊙ set.	Declination. D. M.	South Declination. ⊙rise.	South Declination. ⊙ set.
East	West	0. 0	East	West
	1	2.49	1	
	2	5.37	2	
	3	8.26	3	
e by n	w by n	11.14	e by s	w by s
	1	14. 3	1	
	2	16.51	2	
	3	19.40	3	
e n e	w s w	22.29	e s e	w s w

Latitude 3 Degrees.

North Declination. ⊙rise.	North Declination. ⊙ set.	Declination. D. M.	South Declination. ⊙rise.	South Declination. ⊙ set.
East	West	0. 0	East	West
	1	2.49	1	
	2	5.37	2	
	3	8.25	3	
e by n	w by n	11.14	e by s	w by s
	1	14. 3	1	
	2	16.51	2	
	3	19.39	3	
e n e	w n w	22.27	e s e	w s w

Latitude 4 Degrees.

North Declination. ⊙rise	⊙ſet.	Decli-nation. D. M.	South Declination. ⊙rise	⊙ſet.
East	Weſt	0. 0	East	Weſt
1		2.48	1	
2		5.37	2	
3		8.25	3	
e by n	w by n	11.14	e by s	w by s
1		14.02	1	
2		16.50	2	
3		19.38	3	
e n e	w n w	22.26	e s e	w s w

Latitude 5 Degrees.

North Declination. ⊙rise	⊙ſet.	Decli-nation. D. M.	South Declination. ⊙rise	⊙ſet.
East	Weſt	0. 0	East	Weſt
1		2.48	1	
2		5.37	2	
3		8.24	3	
e by n	w by n	11.12	e by s	w by s
1		14. 1	1	
2		16.49	2	
3		19.36	3	
e n e	w n w	22.23	e s e	w s w

Latitude 6 Degrees.

North Declination. ⊙rise	⊙ſet.	Decli-nation. D. M.	South Declination. ⊙rise	⊙ſet.
East	Weſt	0. 0	East	Weſt
1		2.48	1	
2		5.36	2	
3		8.23	3	
e by n	w by n	11.11	e by s	w by s
1		13.59	1	
2		16.47	2	
3		19.23	3	
e n e	w n w	22.21	e s e	w s w

Latitude 7 Degrees.

North Declination. ⊙rise	⊙ſet.	Decli-nation. D. M.	South Declination. ⊙rise	⊙ſet.
East	Weſt	0. 0	East	Weſt
1		2.48	1	
2		5.35	2	
3		8.20	3	
e by n	w by n	11. 9	e by s	w by s
1		13.58	1	
2		16.45	2	
3		19.31	3	
e n e	w n w	22.19	e s e	w s w

Latitude 8 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.47	1	
2		5.35	2	
3		8.18	3	
e by n	w by n	11. 8	e by s	w by s
1		13.56	1	
2		16.43	2	
3		19.28	3	
e n e	w n w	22.15	e s e	w s w

Latitude 9 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.47	1	
2		5.34	2	
3		8.17	3	
e by n	w by n	11. 6	e by s	w by s
1		13.53	1	
2		16.40	2	
3		19.25	3	
e n e	w n w	22.12	e s e	w s w

Latitude 10 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.47	1	
2		5.33	2	
3		8.16	3	
e by n	w by n	11. 5	e by s	w by s
1		13.51	1	
2		16.37	2	
3		19.21	3	
e n e	w n w	22. 7	e s e	w s w

Latitude 11 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.46	1	
2		5.31	2	
3		8.14	3	
e by n	w by n	11. 3	e by s	w by s
1		13.48	1	
2		16.33	2	
3		19.18	3	
e n e	w n w	22. 3	e s e	w s w

Latitude 12 Degrees.

North Declination. ⊙rise	⊙ſet.	Declination. D. M.	South Declination. ⊙rise	⊙ſet.
East	West	0. 0	East	West
	1	2.45	1	
	2	4.30	2	
	3	8.12	3	
e by n	w by n	11. 0	e by s	w by s
	1	13.45	1	
	2	16.30	2	
	3	19.14	3	
n e	w n w	21.58	e s e	w s w

Latitude 13 Degrees.

North Declination. ⊙rise	⊙ſet.	Declination D. M.	South Declination. ⊙rise	⊙ſet.
East	West	0. 0	East	West
	1	2.45	1	
	2	5.29	2	
	3	8.10	3	
e by n	w by n	11.57	e by s	w by s
	1	13.42	1	
	2	16.26	2	
	3	19. 9	3	
e n e	w n w	21.53	e s e	w s w

Latitude 14 Degrees.

North Declination. ⊙rise	⊙ſet.	Declination. D. M.	South Declination. ⊙rise	⊙ſet.
East	West	0. 0	East	West
	1	2.44	1	
	2	5.28	2	
	3	8. 8	3	
e by n	w by n	10.55	e by s	w by s
	1	13.38	1	
	2	16.22	2	
	3	19. 4	3	
n e	w n w	21.47	e s e	w s w

Latitude 15 Degrees.

North Declination. ⊙rise	⊙ſet.	Declination. D. M.	South Declination. ⊙rise	⊙ſet.
East	West	0. 0	East	West
	1	2.43	1	
	2	5.26	2	
	3	8. 6	3	
e by n	w by n	10.52	e by s	w by s
	1	13.35	1	
	2	16.17	2	
	3	18.59	3	
e n e	w n w	21.41	e s e	w s w

Latitude 16 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.42	1	
2		5.25	2	
3		8. 3	3	
e *by* n	w *by* n	10.49	e *by* s	w *by* s
1		13.31	1	
2		16.12	2	
3		18.53	3	
e n e	w n w	21.34	e s e	w s w

Latitude 17 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.42	1	
2		5.23	2	
3		8. 1	3	
e *by* n	w *by* n	10.45	e *by* s	w *by* s
1		13.26	1	
2		16.08	2	
3		18.47	3	
e n e	w n w	21.27	e s e	w s w

Latitude 18 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.41	1	
2		5.22	2	
3		7.59	3	
e *by* n	w *by* n	10.42	e *by* s	w *by* s
1		13.22	1	
2		16. 2	2	
3		18.40	3	
e n e	w n w	21.20	e s e	w s w

Latitude 19 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.40	1	
2		5.20	2	
3		7.56	3	
e *by* n	w *by* n	10.38	e *by* s	w *by* s
1		13.17	1	
2		15.56	2	
3		18.33	3	
e n e	w n w	21.13	e s e	w s w

Latitude 20 Degrees.

North Declination. ⊙riſe	⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	⊙ſet.
ſt	Weſt	0. 0	Eaſt	Weſt
	1	2.39		1
	2	5.17		2
	3	7.52		3
yn	w byn	10.34	e by s	w by s
	1	13.12		1
	2	15.51		2
	3	18.27		3
e	w nw	21. 5	e s e	w s w

Latitude 21 Degrees.

North Declination. ⊙riſe	⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	⊙ſet.
East	Weſt	0. 0	East	Weſt
	1	2.38		1
	2	5.15		2
	3	7.50		3
e by n	w by n	10.30	e by s	w by s
	1	13. 7		1
	2	15.44		2
	3	18.19		3
e n e	w n w	20.55	e s e	w s w
	1	23.32		1

Latitude 22 Degrees.

North Declination. ⊙riſe	⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	⊙ſet.
aſt	Weſt	0. 0	Eaſt	Weſt
	1	2.37		1
	2	5.13		2
	3	7.47		3
by n	w by n	10.25	e by s	w by s
	1	13. 1		1
	2	15.38		2
	3	18.11		3
n e	w n w	20.46	e s e	w s w
	1	23.22		1

Latitude 23 Degrees.

North Declination. ⊙riſe	⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	⊙ſet.
Eaſt	Weſt	0. 0	Eaſt	Weſt
	1	2.36		1
	2	5.11		2
	3	7.43		3
e by n	w by n	10.21	e by s	w by s
	1	12.56		1
	2	15.31		2
	3	18. 3		3
e n e	w n w	20.37	e s e	w s w
	1	23.11		1

Latitude 24 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.35	1	
2		5. 9	2	
3		7.39	3	
e by n	w by n	10.16	e by s	w by s
1		12.50	1	
2		15.29	2	
3		17.54	3	
e n e	w n w	20.28	e s e	w s w
1		23. 0	1	

Latitude 25 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.33	1	
2		5. 6	2	
3		7.36	3	
e by n	w by n	10.11	e by s	w by
1		12.43	1	
2		15.16	2	
3		17.46	3	
e n e	w n w	20.18	e s e	w s
1		22.48	1	

Latitude 26 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.32	1	
2		5. 4	2	
3		7.32	3	
e by n	w by n	10. 6	e by s	w by s
1		12.35	1	
2		15. 8	2	
3		17.37	3	
e n e	w n w	20. 7	e s e	w s w
1		22.36	1	

Latitude 27 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.31	1	
2		5. 1	2	
3		7.28	3	
e by n	w by n	10. 1	e by s	w by
1		12.30	1	
2		15. 0	2	
3		17.28	3	
e n e	w n w	19.56	e s e	w s
1		22.23	1	

Latitude 28 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	2.29	1	
	2	4.58	2	
	3	7.24	3	
e by n	w by n	9.55	e by s	w by s
	1	12.24	1	
	2	14.51	2	
	3	17.17	3	
e n e	w n w	19.45	e s e	w s w
	1	22.11	1	

Latitude 29 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	2.28	1	
	2	4.55	2	
	3	7.20	3	
e by n	w by n	9.50	e by s	w by s
	1	12.17	1	
	2	14.43	2	
	3	17. 7	3	
e n e	w n w	19.33	e s e	w s w
	1	21.58	1	

Latitude 30 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	2.27	1	
	2	4.52	2	
	3	7.18	3	
e by n	w by n	9.44	e by s	w by s
	1	12. 9	1	
	2	14.34	2	
	3	16.57	3	
e n e	w n w	19.21	e s e	w s w
	1	21.44	1	

Latitude 31 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	2.25	1	
	2	4.50	2	
	3	7.13	3	
e by n	w by n	9.38	s by s	w by s
	1	12. 1	1	
	2	14.25	2	
	3	16.47	3	
e n e	w n w	19. 9	e s e	w s w
	1	21.30	1	

Latitude 32 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.23	1	
2		4.46	2	
3		7. 8	3	
e by n	w by n	9.31	e by s	w by s
1		11.54	1	
2		14.16	2	
3		16.36	3	
e n e	w n w	18.55	e s e	w s w
1		21.16	1	

Latitude 33 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.22	1	
2		4.43	2	
3		7. 4	3	
e by n	w by n	9.25	e by s	w by
1		11.46	1	
2		14. 6	2	
3		16.24	3	
e n e	w n w	18.43	e s e	w s w
1		21. 1	1	
2		23.18	2	

Latitude 34 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.20	1	
2		4.40	2	
3		6.59	3	
e by n	w by n	9.18	e by s	w by s
1		11.38	1	
2		13.56	2	
3		16.12	3	
e n e	w n w	18.30	e s e	w s w
1		20.46	1	
2		23. 1	2	

Latitude 35 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
1		2.18	1	
2		4.37	2	
3		6.54	3	
e by n	w by n	9.12	e by s	w by s
1		11.29	1	
2		13.46	2	
3		16. 2	3	
e n e	w n w	18.16	e s e	w s w
1		20.30	1	
2		22.43	2	

Latitude 36 Degrees.				Latitude 37 Degrees.			
North Declination.		Declination.	South Declination.	North Declination.		Declination.	South Declination.
⊙rise	⊙set.	D. M.	⊙rise ⊙set.	⊙rise	⊙set	D. M.	⊙rise ⊙set.
East	West	0. 0	East West	East	West	0. 0	East West
	1	2.16	1		1	2.15	1
	2	4.33	2		2	4.30	2
	3	6.49	3		3	6.43	3
e by n	w by n	9.05	e by s w by s	e by n	w by n	8.58	e by s w by s
	1	11.21	1		1	11.12	1
	2	13.35	2		2	13.25	2
	3	15.49	3		3	15.36	3
e n e	w n w	18. 2	e s e w s w	e n e	w n w	17.48	e s e w s w
	1	20.15	1		1	19.58	1
	2	22.25	2		2	22. 7	2

Latitude 38 Degrees.				Latitude 39 Degrees.			
North Declination.		Declination.	South Declination.	North Declination.		Declination.	South Declination.
⊙rise	⊙set.	D. M.	⊙rise ⊙set.	⊙rise	⊙set.	D. M.	⊙rise ⊙set.
East	West	0. 0	East West	East	West	0. 0	East West
	1	2.13	1		1	2.11	1
	2	4.26	2		2	4.22	2
	3	6.38	3		3	6.32	3
e by n	w by n	8.50	e by s w by s	e by n	w by n	8.43	e by s w by s
	1	11. 3	1		1	10.53	1
	2	13.14	2		2	13. 3	2
	3	15.23	3		3	15.10	3
e n e	w n w	17.33	e s e w s w	e n e	w n w	17.18	e s e w s w
	1	19.41	1		1	19.25	1
	2	21.49	2		2	21.30	2
					3	23.32	3

Latitude 40 Degrees.

North Declination. ⊙*riſe*	⊙*ſet.*	*Declination.* D. M.	*South Declination.* ⊙*riſe*	⊙*ſet.*
East	Weſt	0. 0	East	Weſt
1		2. 9	1	
2		4.19	2	
3		6.27	3	
e *by* n	w *by* n	8.36	e *by* s	w *by* s
1		10.43	1	
2		12.51	2	
3		14.57	3	
e n e	w n w	17. 3	e s e	w s w
1		19. 7	1	
2		21.10	2	
3		23.11	3	

Latitude 41 Degrees.

North Declination. ⊙*riſe*	⊙*ſet*	*Declination.* D. M.	*South Declination.* ⊙*riſe*	⊙*ſet.*
East	Weſt	0. 0	East	Weſt
1		2. 7	1	
2		4.15	2	
3		6.22	3	
e *by* n	w *by* n	8.28	e *by* s	w *by* s
1		10.34	1	
2		12.40	2	
3		14.44	3	
e n e	w n w	16.47	e s e	w s w
1		18.50	1	
2		20.51	2	
3		22.50	3	

Latitude 42 Degrees.

North Declination. ⊙*riſe*	⊙*ſet.*	*Declination.* D. M.	*South Declination.* ⊙*riſe*	⊙*ſet.*
East	Weſt	0. 0	East	Weſt
1		2. 6	1	
2		4.11	2	
3		6.16	3	
e *by* n	w *by* n	8.20	e *by* s	w *by* s
1		10.24	1	
2		12.28	2	
3		14.30	3	
e n e	w n w	16.31	e s e	w s w
1		18.32	1	
2		20.31	2	
3		22.27	3	

Latitude 43 Degrees.

North Declination. ⊙*riſe*	⊙*ſet.*	*Declination.* D. M.	*South Declination.* ⊙*riſe*	⊙*ſet.*
East	Weſt	0. 0	East	Weſt
1		2. 4	1	
2		4. 7	2	
3		6.10	3	
e *by* n	w *by* n	8.12	e *by* s	w *by* s
1		10.14	1	
2		12.16	2	
3		14.16	3	
e n e	w n w	16.15	e s e	w s w
1		18.14	1	
2		20.10	2	
3		22. 5	3	

Latitude 44 Degrees.				Latitude 45 Degrees.			
North Declination.		Declination.	South Declination.	North Declination.		Declination.	South Declination.
⊙riſe	⊙ſet.	D. M.	⊙riſe | ⊙ſet.	⊙riſe	⊙ſet.	D. M.	⊙riſe | ⊙ſet.
East	Weſt	0. 0	East Weſt	East	Weſt	0. 0	East Weſt
	1	2. 1	1		1	2. 0	1
	2	4. 3	2		2	3.59	2
	3	6. 4	3		3	5.57	3
e by n	w by n	8. 4	e by s w by s	e by n	w by n	7.56	e by s w by s
	1	10. 4	1		1	9.54	1
	2	12. 3	2		2	11.51	2
	3	14. 1	3		3	13.46	3
e ne	w nw	15.59	e se w s w	e ne	w nw	15.42	e se w s w
	1	17.54	1		1	17.36	1
	2	19.50	2		2	19.30	2
	3	21.42	3		3	21.19	3
ne be	nw bw	23.32	se by e sw bw	ne be	nw bw	23. 8	se by e sw b w

Latitude 46 Degrees.				Latitude 47 Degrees.			
North Declination.		Declination.	South Declination.	North Declination.		Declination.	South Declination.
⊙riſe	⊙ſet	D. M.	⊙riſe ⊙ſet.	⊙riſe	⊙ſet.	D. M.	⊙riſe ⊙ſet.
East	Weſt	0. 0	East Weſt	East	Weſt	0. 0	East Weſt
	1	1.58	1		1	1.55	1
	2	3.55	2		2	3.50	2
	3	5.51	3		3	5.45	3
e *by* n	w *by* n	7.47	e *by* s w *by* s	e *by* n	w *by* n	7.39	e *by* s w *by* s
	1	9.43	1		1	9.33	1
	2	11.38	2		2	11.25	2
	3	13.32	3		3	13.17	3
e n e	w n w	15.25	e s e w s w	e n e	w n w	15.08	e s e w s w
	1	17.17	1		1	16.57	1
	2	19. 7	2		2	18.46	2
	3	20.55	3		3	20.31	3
ne *b* e	nw *b* w	22.42	se *by* e sw *b* w	ne *b* e	nw *b* w	22.16	se *by* e sw *b* w

Latitude 48 Degrees.				Latitude 49 Degrees.			
North Decli-nation.		Decli-nation.	South Decli-nation.	North Decli-nation.		Decli-nation.	South Decli-nation.
⊙riſe	⊙ſet.	D. M.	⊙riſe | ⊙ſet.	⊙riſe	⊙ſet.	D. M.	⊙riſe | ⊙ſet.
East	Weſt	0. 0	East Weſt	East	Weſt	0. 0	East Weſt
	1	1.53	1		1	1.51	1
	2	3.46	2		2	3.42	2
	3	5.38	3		3	5.31	3
e *by* n	w *byn*	7.30	e *by* s w *by* s	e *by* n	w *byn*	7.22	e *by* s w *bys*
	1	9.22	1		1	9.10	1
	2	11.12	2		2	10.59	2
	3	13. 1	3		3	12.46	3
e n e	w nw	14.50	e s e w s w	e n e	w n w	14.28	e s e w s w
	1	16.38	1		1	16.17	1
	2	18.24	2		2	18. 1	2
	3	20. 7	3		3	19.42	3
n *c be*	nw *b* w	21.49	s c *by* e s w *b* w	n *c be*	nw *b* w	21.22	s c *by* e s w *b* w
	1	23.29	1		1	23. 1	1

Latitude 50 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	1.48	1	
	2	3.37	2	
	3	5.25	3	
e *by* n	w *by* n	7.12	e *by* s	w *by* s
	1	8.59	1	
	2	10.46	2	
	3	12.30	3	
e n e	w n w	14.14	e s e	w s w
	1	15.57	1	
	2	17.39	2	
	3	19.18	3	
n e *b* e	n w *b* w	20.55	s e *by* e	s w *b* w
	1	22.31	1	

Latitude 51 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	1.46	1	
	2	3.33	2	
	3	5.18	3	
e *by* n	w *by* n	7. 4	e *by* s	w *by* s
	1	8.48	1	
	2	10.32	2	
	3	12.14	3	
e n e	w n w	13.56	e s e	w s w
	1	15.36	1	
	2	17.16	2	
	3	18.52	3	
n e *b* e	n w *b* w	20.28	s e *by* e	s w *b* w
	1	22. 1	1	
	2	23.32	2	

Latitude 52 Degrees.				Latitude 53 Degrees.			
North Decli-nation.		*Decli-nation.*	*South Decli-nation.*	*North Decli-nation.*		*Decli-nation.*	*South Decli-nation.*
⊙*riſe*	⊙*ſet.*	D. M.	⊙*riſe* ⊙*ſet.*	⊙*riſe*	⊙*ſet.*	D. M.	⊙*riſe* ⊙*ſet.*
East	Weſt	0. 0	East Weſt	East	Weſt	0. 0	East Weſt
	1	1.44	1		1	1.42	1
	2	3.28	2		2	3.23	2
	3	5.11	3		3	5. 4	3
e *by* n	w *by* n	6.54	e *by* s w *by* s	e *by* n	w *by* n	6.44	e *by* s w *by* s
	1	8.37	1		1	8.25	1
	2	10.18	2		2	10. 4	2
	3	11.58	3		3	11.41	3
e n e	w n w	13.37	e s e w s w	e n e	w n w	13.19	e s e w s w
	1	15.16	1		1	14.55	1
	2	16.52	2		2	16.29	2
	3	18.27	3		3	18. 1	3
ne *b* e	nw *bw*	20. 0	se *bye* sw *b* w	ne *b* e	nw *bw*	19.32	se *bye* sw *b* w
	1	21.31	1		1	21. 1	1
	2	23. 0	2		2	22.27	2

Latitude 54 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	1.39	1	
	2	3.18	2	
	3	4.57	3	
e *by* n	w *by* n	6.35	e *by* s	w *by* s
	1	8.13	1	
	2	9.50	2	
	3	11.25	3	
e n e	w n w	13. 0	e s e	w s w
	1	14.33	1	
	2	16. 5	2	
	3	17.35	3	
n e *b* e	n w *b* w	19. 3	s e *by* e	s w *b* w
	1	20.30	1	
	2	21.54	2	
	3	23.15	3	

Latitude 55 Degrees.

North Declination. ⊙rise	⊙set.	Declination. D. M.	South Declination. ⊙rise	⊙set.
East	West	0. 0	East	West
	1	1.37	1	
	2	3.14	2	
	3	4.49	3	
e *by* n	w *by* n	6.25	e *by* s	w *by* s
	1	8. 1	1	
	2	9.35	2	
	3	11. 8	3	
e n e	w n w	12.41	e s e	w s w
	1	14.12	1	
	2	15.42	2	
	3	17. 9	3	
n e *b* e	n w *b* w	18.35	s e *by* e	s w *b* w
	1	19.59	1	
	2	21.21	2	
	3	22.39	3	

Latitude 56 Degrees.

North Declination. ⊙riſe	North Declination. ⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	South Declination. ⊙ſet.
East	West	0. 0	East	West
	1	1.34	1	
	2	3. 9	2	
	3	4.42	3	
e by n	w by n	6.16	e by s	w by s
	1	7.49	1	
	2	9.21	2	
	3	10.51	3	
e n e	w n w	12.22	e s e	w s w
	1	13.50	1	
	2	15.18	2	
	3	16.42	3	
ne be n	w b w	18. 6	se bye	sw bw
	1	19.28	1	
	2	20.47	2	
	3	22. 3	3	
n e n	w n w	23.18	s e	s w

Latitude 57 Degrees.

North Declination. ⊙riſe	North Declination. ⊙ſet.	Declination. D. M.	South Declination. ⊙riſe	South Declination. ⊙ſet.
East	West	0. 0	East	West
	1	1.32	1	
	2	3. 4	2	
	3	4.35	3	
e by n	w by n	6. 6	e by s	w by s
	1	7.36	1	
	2	9. 6	2	
	3	10.34	3	
e n e	w n w	12. 1	e s e	w s w
	1	13.28	1	
	2	14.53	2	
	3	16.16	3	
ne bye	nw bw	17.37	se bye	sw bw
	1	18.56	1	
	2	20.13	2	
	3	21.27	3	
n e n	w n w	22.39	s e	s w

Latitude 58 Degrees.					Latitude 59 Degrees.				
North Declination.		Declination.	South Declination.		North Declination.		Declination.	South Declination.	
⊙riſe	⊙ſet.	D. M.	⊙riſe	⊙ſet.	⊙riſe	⊙ſet.	D. M.	⊙riſe	⊙ſet.
East	Weſt	0. 0	East	Weſt	East	Weſt	0. 0	East	Weſt
1		1.30	1		1		1.27	1	
2		2.59	2		2		2.54	2	
3		4.28	3		3		4.20	3	
e *by* n	w*by*n	5.56	e *by* s	w *by*s	e *by* n	w*by* n	5.46	e *by* s	w *by* s
1		7.24	1		1		7.11	1	
2		8.51	2		2		8.36	2	
3		10.17	3		3		10. 0	3	
e n e	w nw	11.42	e s e	w s w	e n e	w n w	11.22	e s e	w s w
1		13. 6	1		1		12.42	1	
2		14.28	2		2		14. 3	2	
3		15.48	3		3		15.21	3	
ne*be*	nw*b* w	17. 7	se*bye*	sw*bw*	ne*bye*	nw*bw*	16.37	se*bye*	sw*bw*
1		18.24	1		1		17.52	1	
2		19.38	2		2		19. 4	2	
3		20.50	3		3		20.14	3	
ne n	w	22. 0	s e s	w	ne n	w	21.22	s e s	w
1		23. 8	1		1		22.26	1	
					2		23.27	2	

Latitude 60 Degrees.

North Declination.			South Declination.		
⊙ riſe.	D. M.	⊙ ſet.	⊙ riſe.	D. M.	⊙ ſet.
East	0. 0	Weſt.	East	0. 0	Weſt
1	1. 25	1	1	1. 25	1
2	2. 49	2	2	2. 49	2
3	4. 12	3	3	4. 12	3
e *by* n	5. 36	w *by* n	e *by* s	5. 36	w *by* s
1	6. 59	1	1	6. 59	1
2	8. 21	2	2	8. 21	2
3	9. 42	3	3	9. 42	3
e n e	11. 2	w n w	e s e	11. 2	w s w
1	12. 21	1	1	12. 21	1
2	13. 38	2	2	13. 38	2
3	14. 53	3	3	14. 53	3
n e *by* e	16. 8	n w *by* w	s e *by* e	16. 8	s w *by* w
1	17. 20	1	1	17. 20	1
2	18. 30	2	2	18. 30	2
3	19. 38	3	3	19. 38	3
n e	20. 42	n w	s e	20. 42	s w
1	21. 45	1	1	21. 45	1
2	22. 44	2	2	22. 44	2

The

The *Deſcription* and *Uſe* OF THE Foregoing Tables.

1. THeſe *Tables* of Points of the Compaſs, and of the Degrees which the *Sun*, or any *Star* (whoſe Declination exceeds not 23 *d.* 30 *m.*) begin at Latitude 0 Degree, and proceeding orderly to 60 Degrees, (being ſome 4, ſome 2 *Tables* in one Page) are 61 in all.

2. In each *Table* are 5 *Columns*, the middle-moſt contains the *Degrees of Declination*, *either North or South*; thoſe 2 on the left-hand of it, is *Sun's Riſing* and *Setting*, *under North Declination*; and on the right-hand is the like, under *South Declination.*

3. The 1*ſt* and 2*d Columns* (under *North-Declination*), as alſo the 4*th* and 5*th* (under *South-Declination*), contain the Points, and each quarter of a Point of the Compaſs, of both *Riſing* and *Setting*. Thus, *Eaſt Weſt*, under which, is 1, 2, 3; that is, *Eaſt*, or *Weſt* 1 *quarter*, 2 *quarters*, 3 *quarters Northerly*, *Southerly*: then E *by* N, W *by* N, under which is 1, 2, 3; that is, *Eaſt and by North*, or *Weſt and by North*, 1 *quarter*, 2 *quarters Northerly*, &c.

Theſe

Theſe Tables are ready Helps to find the Variation of the Compaſs, with eaſe and ſufficient exactneſs; evidently made out in the following Uſes.

To find the Point of the Compaſs that the Sun riſeth or ſets at, in any time of the Year.

FIrſt ſeek the *Sun's Declination* in the *Table of Declination* for the Time propoſed; with which, enter the Foregoing Table, finding the *Latitude* in the head of the Table, and the *Declination* in the *2d Column*; againſt which, on the left-hand, if it be *North Declination*; but on the right-hand, if it be *South-Declination*, you will find the *Point of the Compaſs that the Sun riſeth or ſets at*: according to the Titles at the head of the Table.

Note; Theſe Tables ſhew the true points of the Sun's Riſing or Setting: ſo that you may readily know at any time, ſeeing the Sun riſe or ſet, the Variation by an ordinary *Meridian Compaſs*.

There are ſome Compaſſes not touched ſo well as they ought to be: others, in time, the Virtue of the Stone wears off from the Needle.

Now by theſe foregoing Tables, you may very readily diſcover any of theſe Defects.

But it may be objected, that they cannot ſet the Sun by an ordinary *Meridian Compaſs*, ſo near as is required in ſuch a Caſe as this is.

To this I anſwer; It's as eaſy to ſet the Sun by the Compaſs, as ſteer a Ship by it: For expert Sea-men

can

can ſet the *Sun*, or a *Head-land*, to near a quarter of a Point, by their Hand, (but with Sights, much nearer the Truth).

The Poſture to obſerve in ſuch a Caſe, I adviſe, is thus;

Set the Compaſs about two foot high: and directing your Hand toward the *Sun*; note what *Point*, *half Point* or *quarter Point*, the *Sun* riſeth or ſetteth on; then, in that Table belonging to your Latitude, ſee whether the *Sun* riſeth or ſets that Day upon the ſame *Point*, found by *Obſervation*: if they agree, there is no *Variation*; but if they do not agree, the *Compaſs* is not true, or there is *Variation*; and the Variation is ſo much as is the Difference between the Obſervation and the Table.

Example 1.

Admit in Latitude 30 d. *the Sun having* 9 d. 44 m. *North-Declination*; *I obſerve the Sun that Day to riſe upon the E. N. E. Point of the Compaſs*; *I demand the Variation?*

In the head of the foregoing *Tables*, look for the *Latitude* 30 *Degrees*, and in the third Column for 9 *d.* 44 *m.* North-Declination; againſt it (under Sun-riſe) I find E. by N. which ſheweth that there is one Point Variation. For it appears by the *Table*, that the E. N. E. *Point on the Compaſs*, is the true E. by N. *Point*; and the E. by N. (*as it is upon the Compaſs*) is the true *Eaſt-Point*; the *Eaſt-Point* is the true E. by S; the S.E. is the S.E. by S; and the *South* is the S. by W; the *Weſt* is the W. by N; and the *North* is the N. by E.

This

This plainly appears by the *Rectifier*; if you bring he E. by N. on the inward Circle, to touch the E.N.E. n the outward Circle.

Now, ſuppoſe we were to obſerve the Sun at his tting, *in the Latitude of* 30 *degrees, with Declination* 9 *deg.* 44 *min. North*, as aboveſaid, we ſhould find he *Sun* to ſet exactly at *Weſt* by the Compaſs, although by *Obſervation in the Morning*, we did find he *Sun* to riſe at E. N. E. I know this will be little ſs than a Contradiction to ſome: but if you caſt our Eye upon the *Rectifier*, you may ſee it is a certain ruth.

Example 2.

In Latitude 37 d. the Sun's Declination 8 d. 58 m. orth, I obſerve the Sun to riſe upon the E. by N. Point the Compaſs; I demand the Variation?

In the Table that belongs to 37 *d.* againſt 8 *d.* 58 *m.* orth-Declination, (and under Sun-riſe) I find E. N; which ſheweth (ſeeing the *Obſervation* doth gree with the *Table*) there is no *Variation*.

Note; If the *Declination* for the Day propoſed be ot the ſame with the *Declination* in the *Tables*, then ave regard to the neareſt, allowing for the Difference.

Example 3.

In Latitude 37 d. 0 m. ſuppoſe the Declination 0 d. 15 m. North; I demand the Point of the Comaſs that the Sun ſhould riſe with?

In

In the *Table*, the neareſt to 10 *d.* 15 *m.* is 11 *d.* 12 *m.* againſt which, the Sun riſeth E. by N. $\frac{1}{4}$ N. and ſets W. by N. $\frac{1}{4}$ N; but becauſe the Declination propoſed, is near about the middle between 8 *d.* 48 *m.* and 11 *d.* 12 *m.* therefore the Sun riſeth E. by N. half a quarter N. and ſetteth W. by N. half a quarter N.

Underſtand the like in any other caſe, let the Declination be what it will, in any other Latitude.

Example 4.

Admit in Latitude 38 *d.* 20 *m.* and Declination 19 *d.* 50 *m.* South, I obſerve the Sun to riſe upon the E. S. E. Point of the Compaſs; I demand the Variation?

In the Table for Latitude 38 *d.* and againſt 19 *d.* 41 *m.* (the neareſt to my *Declination*) I find E. S. E. a quarter S; which ſheweth, that there is a quarter of a Point *Variation*: For the E. S. E. Point is E. S. E. $\frac{1}{4}$ S, and the North Point is N. $\frac{1}{4}$ E: For if you do bring E. S. E. $\frac{1}{4}$ S. on the inward Circle of the *Rectifier*, to touch E. S. E. on the outward Circle, then S. S. W. on your Compaſs, is S. S. W. $\frac{1}{4}$ W, and S. E. is S. E. $\frac{1}{4}$ S; and Eaſt is Eaſt $\frac{1}{4}$ S: and ſo for any other Point, half Point, or quarter Point; by caſting your Eye upon the Inſtrument.

Note; That the Tables ſhew the true *Points of riſing and ſetting*, and the inward Circle on the *Rectifier* doth the ſame: But the *Compaſs*, when it differeth from the *Tables*, ſheweth a falſe Point; and the outward *Circle on the Rectifier* doth the ſame.

Exampl

Example 5.

Admit in Latitude 47 d. 24 m. the Declination 15. d. 2 m. South, the Sun riſing upon the E. by S. Point of the Compaſs; I demand the Variation?

By the *Tables* the *Sun* ſhould riſe E.S.E. therefore here is one Point Variation: for if you bring the E. by E. on the inward Circle of the *Rectifier*, to touch the E. by S. on the outward, then the N. by W. on the *Compaſs*, is the true North Point; the N.W. is the N. W. by N; and the S. by E. is the true South Point.

By this time, I ſuppoſe my Reader able to diſcover, how much the *Variation* is, and how to reckon it, without any *Geometrical Demonſtration*, or *Arithmetical Calculation*.

Note; If you have any odd minutes of *Latitude*, go to that *Table* neareſt the *Latitude* you are in.

I come now to reſolve a Queſtion ſome are puzled with; and that is ſuch as this:

Queſt. If the Sun riſe at E.N.E. in any Latitude, ſhould he not ſet the ſame Day at W.N.W. in the ſame Latitude?

Anſw. If there be no *Variation*, it will; but if there be *Variation*, it will not be ſo: the Reaſon is evident by the *Rectifier*.

By theſe *Tables* you may know the Point of the Compaſs, that any of the fixed *Stars* do riſe and ſet

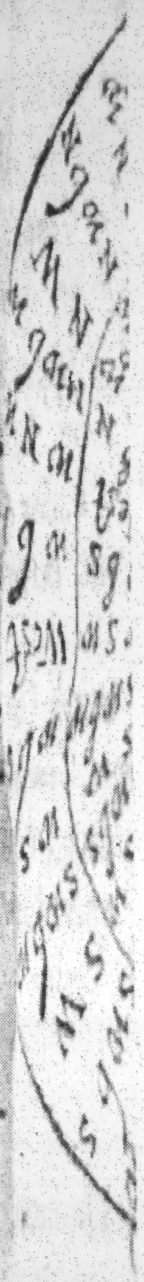
with in any Latitude,(the Tables contain) either North or South; if their Declination do not exceed the Sun's greateſt Declination.

Example 6.

Let it be required to find the Point of the Compaſs that the *Bull's-Eye* riſeth and ſets with, in the Latitude of 50 Degrees?

The Declination of this Star is 15 *d.* 47 *m.* North; in the Table that belongs to 50 *d.* againſt 15 *d.* 47 *m.* North-Declination; the Point of riſing is E.NE. $\frac{1}{4}$ N. and the Point of ſetting W.N.W. $\frac{1}{4}$ N.

Underſtand the like for any other Star, whoſe Declination doth not exceed the Sun's greateſt Declination.



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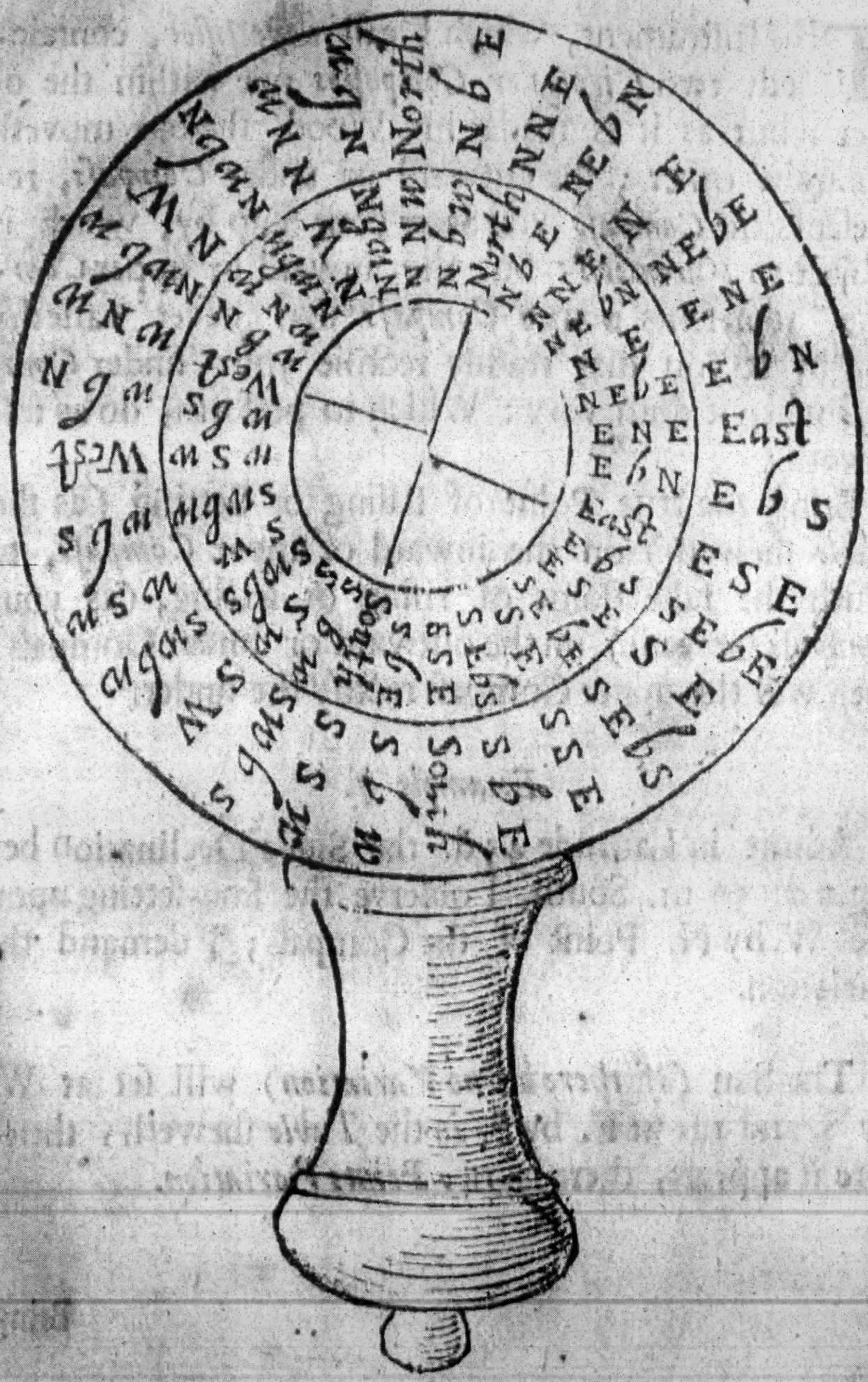


The Deſcription and Uſe of the Rectifier.

THis Inſtrument, which I call a *Rectifier*, containeth two *Circles or Compaſſes* one within the other; but as it is made in Wood, the one moveth upon the other; the outward or under *Compaſs*, repreſents the *Compaſs* you Steer your Ship by, which is ſubject to *Variation*: but the inward or upper *Compaſs*, repreſents a true *Compaſs* that never varieth; and by it you may readily rectifie your under *Compaſs* when it doth vary: Which to perform, do as followeth;

Bring the true Point of Riſing or Setting (as the *Table* ſheweth) on the inward or upper *Compaſs*, to touch the falſe Point of riſing or ſetting, (as your *Compaſs* ſheweth) on the outward or under Compaſs; then will the upper Compaſs rectify the under.

Example 7.

Admit in Latitude 45 d. the Sun's Declination being 7 d. 56 m. South, I obſerve the Sun-ſetting upon the W. by N. Point of the Compaſs; I demand the Variation.

The Sun (*if there be no Variation*) will ſet at W. by S. and riſe at E. by S. as the *Table* ſheweth; therefore it appears, there is *two Points Variation*.

Bring

Bring the W. by S. Point on the inward *Compaſs* to touch the W. by N. Point on the outward *Compaſs:* Then the Points upon the inward *Compaſs*, do explain the Points that are upon the outward; ſo that according to the foregoing *Obſervation*, the N. N. E. *Point on your Compaſs*, is the true North; the North is the true N.N.W; the W. by N. is the true W. by S.; the S. E. by E. is the true E. by S; and ſo for any other *Point of the Compaſs*, by only looking on the *Rectifier*.

And thus you may rectify the *Compaſs*, without reckoning which way the *Variation* is, either *Eaſtward* or *Weſtward*; the *Rectifier* doth that for you ſo plain, that you cannot be miſtaken.

ADVERTISEMENT.

THis *Rectifier* is made in Wood by *James Atkinſon* at the Cherry-Garden-ſtairs, on *Rotherhith-Wall*.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Degrees of Declination. Sun's Decli.	1 D. M.	2 D. M.	3 D. M.	4 D. M.	5 D. M.	6 D. M.
00	00	00	00	00	00	00
01	01	01	01	01	01	01
02	02	02	02	02	02	02
03	03	03	03	03	03	03 1
04	04	04	04	04	04 1	04 1
05	05	05	05	05	05 1	05 1
06	06	06	06	06 1	06 1	06 2
07	07	07	07	07 1	07 1	07 2
08	08	08	08 1	08 1	08 2	08 2
09	09	09	09 1	09 1	09 2	09 2
10	10	10	10 1	10 1	10 2	10 3
11	11	11	11 1	11 1	11 2	11 3
12	12	12	12 1	12 1	12 3	12 4
13	13	13	13 1	13 1	13 3	13 4
14	14	14	14 1	14 2	14 3	14 4
15	15	15	15 1	15 2	15 3	15 5
16	16	16 1	16 1	16 2	16 4	16 5
17	17	17 1	17 1	17 2	17 4	17 5
18	18	18 1	18 1	18 2	18 4	18 6
19	19	19 1	19 1	19 2	19 4	19 6
20	20	20 1	20 2	20 3	20 5	20 6
21	21	21 1	21 2	21 3	21 5	21 7
22	22	22 1	22 2	22 3	22 5	22 7
23	23	23 1	23 2	23 3	23 5	23 8
23,31	23 31	23 32	23 33	23 35	23 37	23 39

A Table of Amplitudes, ſetting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decli.	7		8		9		10		11		12	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00		00		00		00		00		00	
01	01		01		01		01	1	01	1	01	1
02	02	1	02	1	02	1	02	2	02	2	02	3
03	03	1	03	1	03	1	03	3	03	3	03	4
04	04	2	04	2	04	2	04	4	04	4	04	5
05	05	2	05	2	05	3	05	5	05	5	05	7
06	06	2	06	3	06	4	06	6	06	6	06	8
07	07	3	07	4	07	5	07	7	07	8	07	9
08	08	3	08	4	08	6	08	8	08	9	08	11
09	09	4	09	5	09	6	09	9	09	10	09	12
10	10	4	10	6	10	7	10	10	10	11	10	13
11	11	5	11	6	11	8	11	11	11	13	11	15
12	12	5	12	7	12	9	12	12	12	14	12	16
13	13	6	13	8	13	9	13	13	13	15	13	17
14	14	6	14	8	14	10	14	14	14	16	14	19
15	15	7	15	9	15	11	15	15	15	17	15	20
16	16	7	16	10	16	12	16	16	16	19	16	22
17	17	8	17	10	17	13	17	17	17	20	17	23
18	18	8	18	11	18	14	18	18	18	21	18	25
19	19	9	19	12	19	15	19	19	19	22	19	26
20	20	9	20	12	20	16	20	20	20	24	20	28
21	21	10	21	13	21	17	21	21	21	25	21	29
22	22	10	22	13	22	18	22	22	22	27	22	31
23	23	11	23	14	23	19	23	23	23	28	23	33
23,31	23	42	23	46	23	50	23	54	23	59	24	05

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decli.	13		14		15		16		17		18	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	02	01	02	01	02	01	02	01	02	01	03
02	02	03	02	04	02	04	02	05	02	05	02	06
03	03	05	03	05	03	06	03	07	03	08	03	09
04	04	06	04	07	04	08	04	10	04	11	04	12
05	05	08	05	09	05	10	05	12	05	13	05	15
06	06	10	06	11	06	13	06	15	06	17	06	19
07	07	11	07	13	07	15	07	17	07	19	07	22
08	08	13	08	15	08	17	08	19	08	22	08	25
09	09	14	09	17	09	19	09	22	09	25	09	28
10	10	16	10	19	10	21	10	24	10	28	10	31
11	11	17	11	20	11	23	11	27	11	30	11	34
12	12	19	12	22	12	25	12	29	12	33	12	38
13	13	20	13	24	13	27	13	32	13	36	13	41
14	14	22	14	26	14	30	14	34	14	39	14	44
15	15	24	15	28	15	32	15	37	15	42	15	47
16	16	26	16	30	16	35	16	40	16	45	16	51
17	17	28	17	32	17	37	17	42	17	48	17	54
18	18	30	18	34	18	39	18	45	18	51	18	58
19	19	31	19	36	19	42	19	48	19	54	20	01
20	20	33	20	38	20	44	20	51	21	57	21	04
21	21	35	21	40	21	46	21	53	22	00	22	08
22	22	37	22	43	22	49	22	56	23	04	23	12
23	23	39	23	45	23	51	23	58	24	06	24	15
23,31	24	11	24	17	24	24	24	32	25	40	24	49

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

Sun's Decl.	The Degrees of Latitude. 19 D.	M.	20 D.	M.	21 D.	M.	22 D.	M.	23 D.	M.	24 D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	03	01	04	01	04	01	05	01	05	01	06
02	02	07	02	08	02	08	02	09	02	10	02	12
03	03	10	03	12	03	13	03	14	03	15	03	17
04	04	14	04	16	04	17	04	19	04	21	04	23
05	05	17	05	19	05	21	05	23	05	26	05	28
06	06	21	06	23	06	26	06	28	06	31	06	34
07	07	24	07	27	07	30	07	33	07	37	07	40
08	08	28	08	31	08	34	08	38	08	42	08	46
09	09	31	09	35	09	39	09	43	09	47	09	51
10	10	35	10	39	10	43	10	48	10	52	10	57
11	11	38	11	43	11	48	11	53	11	58	12	03
12	12	42	12	47	12	52	12	58	13	03	13	09
13	13	46	13	51	13	57	14	03	14	09	14	15
14	14	50	14	55	15	01	15	08	15	14	15	21
15	15	53	16	00	16	06	16	13	16	20	16	27
16	16	57	17	04	17	11	17	18	17	26	17	34
17	18	01	18	08	18	15	18	23	18	31	18	40
18	19	05	19	12	19	20	19	28	19	37	19	46
19	20	08	20	16	20	24	20	33	20	42	20	52
20	21	12	21	20	21	29	21	39	21	49	21	59
21	22	16	22	25	22	34	22	44	22	55	23	07
22	23	20	23	29	23	39	23	50	24	01	24	12
23	24	24	24	34	24	44	24	55	25	07	25	19
23,31	24	58	25	08	25	18	25	29	25	41	25	54

Degrees of Declination.

A Table of Amplitudes, fetting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decli.	25 D. M.	26 D. M.	27 D. M.	28 D. M.	29 D. M.	30 D. M.
00	00	00	00	00	00	00
01	01 6	01 7	01 8	01 8	01 9	01 9
02	02 12	02 13	02 15	02 16	02 17	02 18
03	03 18	03 20	03 22	03 24	03 26	03 28
04	04 25	04 27	04 29	04 32	04 34	04 37
05	05 31	05 34	05 37	05 40	05 43	05 46
06	06 37	06 41	06 44	06 48	06 52	06 56
07	07 43	07 47	07 51	07 56	08 1	08 06
08	08 50	08 54	08 59	09 4	09 9	09 15
09	09 56	10 1	10 6	10 12	10 18	10 24
10	11 3	11 8	11 14	11 21	11 27	11 34
11	12 9	12 15	12 21	12 28	12 36	12 44
12	13 16	13 28	13 30	13 37	13 45	13 53
13	14 22	14 30	14 37	14 45	14 54	15 3
14	15 29	15 37	15 45	15 54	16 3	16 12
15	16 35	16 44	16 53	17 3	17 12	17 23
16	17 42	17 51	18 1	18 11	18 21	18 32
17	18 49	18 59	19 9	19 20	19 31	19 43
18	19 56	20 6	20 17	20 29	20 41	20 54
19	21 2	21 13	21 25	21 38	21 51	22 5
20	22 10	22 22	22 34	22 48	23 2	23 16
21	23 18	23 30	23 43	23 57	24 12	24 27
22	24 24	24 37	24 51	25 6	25 22	25 38
23	25 32	25 46	26 1	26 16	26 32	26 49
23,31	26 8	26 23	26 29	26 46	27 3	27 21

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	31		32		33		34		35		36	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	10	01	10	01	11	01	12	01	13	01	14
02	02	19	02	21	02	23	02	25	02	27	02	29
03	03	30	03	33	03	35	03	38	03	40	03	43
04	04	40	04	43	04	46	04	50	04	57	04	57
05	05	50	05	54	05	58	06	02	06	06	06	11
06	07	00	07	05	07	10	07	15	07	20	07	25
07	08	11	08	16	08	21	08	27	08	33	08	40
08	09	21	09	27	09	33	09	39	09	46	09	54
09	10	31	10	38	10	45	10	52	11	00	11	08
10	11	41	11	48	11	55	12	03	12	12	12	21
11	12	52	13	00	13	09	13	18	13	28	13	39
12	14	02	14	11	14	21	14	32	14	43	14	54
13	15	13	15	23	15	33	15	44	15	56	16	09
14	16	22	16	33	16	45	16	57	17	10	17	24
15	17	34	17	46	17	58	18	11	18	25	18	40
16	18	44	18	57	19	11	19	25	19	40	19	55
17	19	56	20	10	20	24	20	39	20	55	21	11
18	21	07	21	21	21	36	21	53	22	10	22	27
19	22	19	22	34	22	50	23	07	23	25	23	44
20	23	31	23	47	24	04	24	22	24	41	25	00
21	24	43	25	00	25	18	25	37	25	56	26	17
22	25	55	26	13	26	32	26	52	27	13	27	35
23	27	07	27	26	27	46	28	07	28	29	28	52
23.31	27	40	28	00	28	21	28	43	29	07	29	31

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

Degrees of Latitude.

Sun's Decl.	37		38		39		40		41		42	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	15	01	16	01	17	01	18	01	20	01	21
02	02	30	02	32	02	34	02	36	02	39	02	41
03	03	45	03	48	03	51	03	54	03	58	04	01
04	05	00	05	04	05	08	05	13	05	18	05	23
05	06	16	06	21	06	26	06	32	06	38	06	45
06	07	31	07	37	07	43	07	50	07	57	08	05
07	08	47	08	54	09	01	09	09	09	17	09	26
08	10	02	10	10	10	19	10	28	10	37	10	47
09	11	17	11	27	11	37	11	47	11	58	12	08
10	12	32	12	43	12	54	13	06	13	18	13	31
11	13	50	14	01	14	13	14	26	14	39	14	53
12	15	06	15	18	15	31	15	45	16	00	16	15
13	16	22	16	35	16	49	17	04	17	20	17	37
14	17	38	17	52	18	08	18	24	18	42	19	00
15	18	55	19	11	19	28	19	45	20	04	20	24
16	20	11	20	28	20	46	21	05	21	25	21	46
17	21	28	21	46	22	06	22	26	22	48	23	10
18	22	46	23	05	23	25	23	47	24	10	24	34
19	24	04	24	24	24	46	25	09	25	33	25	58
20	25	21	25	43	26	06	26	30	26	56	27	24
21	26	39	27	02	27	27	27	53	28	21	28	50
22	27	58	28	23	28	49	29	16	29	45	30	16
23	29	17	29	43	30	11	30	40	31	11	31	43
23,31	29	57	30	24	30	52	31	22	31	54	32	28

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	43		44		45		46		47		48	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	22	01	23	01	25	01	26	01	28	01	29
02	03	44	02	47	02	50	02	53	02	56	02	59
03	04	06	04	10	04	15	04	19	04	24	04	29
04	05	28	05	34	05	40	05	46	05	52	05	59
05	06	51	06	58	07	05	07	12	07	20	07	29
06	08	13	08	21	08	30	08	39	08	49	08	59
07	09	35	09	45	09	56	10	06	10	18	10	30
08	10	58	11	09	11	21	11	34	11	47	12	00
09	12	21	12	34	12	47	13	01	13	16	13	31
10	13	44	13	58	14	13	14	28	14	44	15	02
11	15	07	15	22	15	38	15	55	16	15	16	34
12	16	31	16	48	17	06	17	25	17	45	18	06
13	17	55	18	13	18	33	18	54	19	16	19	39
14	19	18	19	39	20	00	20	23	20	47	21	12
15	20	43	21	05	21	28	21	52	22	18	22	45
16	22	08	22	32	22	56	23	23	23	50	24	20
17	23	34	23	59	24	25	24	53	25	23	25	55
18	24	59	25	26	25	54	26	25	26	57	27	31
19	26	25	26	54	27	25	27	58	28	32	29	07
20	27	53	28	23	28	56	29	31	30	07	30	45
21	29	20	29	53	30	27	31	03	31	42	32	23
22	30	48	31	22	31	58	32	37	33	18	34	03
23	32	16	32	51	33	30	34	12	34	56	35	43
31	33	03	33	40	34	20	35	03	35	48	36	35

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

Degrees of Latitude.

Sun's Decl.	49 D.	49 M.	50 D.	50 M.	51 D.	51 M.	52 D.	52 M.	53 D.	53 M.	54 D.	54 M.	55 D.	55 M.
00	00	00	00	00	00	00	00	00	00	00	00	0	00	00
01	01	31	01	33	01	35	01	37	01	39	01	4	01	45
02	03	03	03	06	03	10	03	15	03	20	03	2	03	29
03	04	34	04	40	04	46	04	52	04	59	05	0	05	14
04	06	06	06	14	06	22	06	30	06	39	06	4	06	51
05	07	38	07	48	07	58	08	08	08	19	08	3	08	4
06	09	10	09	21	09	33	09	46	10	00	10	5	10	3
07	10	42	10	55	11	09	11	24	11	40	11	1	12	1
08	12	14	12	29	12	45	13	02	13	21	13	4	14	0
09	13	47	14	05	14	24	14	43	15	04	15	5	15	4
10	15	21	15	40	16	01	16	23	16	46	17	7	17	1
11	16	54	17	16	17	39	18	03	18	29	18	9	19	2
12	18	28	18	52	19	18	19	44	20	12	20	1	21	1
13	20	03	20	29	20	57	21	26	21	57	22	3	23	0
14	21	38	22	06	22	37	23	08	23	42	24	4	24	5
15	23	14	23	45	24	18	24	52	25	28	26	1	26	4
16	24	51	25	24	25	59	26	36	27	16	27	1	28	4
17	26	28	27	03	27	41	28	21	29	04	29	3	30	3
18	28	06	28	43	29	24	30	07	30	53	31	3	32	3
19	29	45	30	25	31	08	31	55	32	45	33	3	34	3
20	31	25	32	08	32	54	33	46	34	39	35	3	36	3
21	33	06	33	52	34	41	35	34	36	31	37	3	38	3
22	34	48	35	37	36	30	37	27	38	29	39	3	40	4
23	36	33	37	26	38	28	39	24	40	29	41	4	42	4
23,31	37	26	38	20	39	19	40	23	41	32	42	4	43	4

Degrees of Declination.

A Table of Amplitudes, fitting all Places from the Equinoctial to 60 Degrees of Latitude, either North or South.

The Degrees of Latitude.

Sun's Decl.	55		56		57		58		59		60	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
00	00	00	00	00	00	00	00	00	00	00	00	00
01	01	45	01	47	01	50	01	53	01	56	02	00
02	03	29	03	34	03	40	03	46	03	53	04	00
03	05	14	05	22	05	31	05	40	05	50	06	00
04	06	59	07	10	07	22	07	34	07	47	08	01
05	08	44	08	57	09	11	09	26	09	43	10	02
06	10	30	10	47	11	04	11	22	11	42	12	04
07	12	15	12	35	12	56	13	18	13	41	14	06
08	14	02	14	24	14	48	15	14	15	41	16	10
09	15	49	16	14	16	41	17	10	17	41	18	14
10	17	37	18	05	18	35	19	07	19	41	20	18
11	19	26	19	56	20	29	21	04	21	43	22	26
12	21	15	21	49	22	25	23	04	23	47	24	34
13	23	05	23	43	24	23	25	07	25	54	26	45
14	24	56	25	37	26	21	27	09	28	01	28	56
15	26	49	27	34	28	22	29	14	30	10	31	10
16	28	43	29	32	30	24	31	21	32	22	33	27
17	30	39	31	31	32	27	33	28	34	32	35	47
18	32	35	33	33	34	34	35	40	36	52	38	10
19	34	35	35	36	36	43	37	54	39	13	40	37
20	36	36	37	42	38	53	40	12	41	37	43	10
21	38	39	39	51	41	09	42	34	44	05	45	47
22	40	47	42	04	43	27	44	59	46	40	48	32
23	42	56	44	19	45	50	47	30	49	21	51	24
23 31	44	06	45	32	47	05	48	49	50	44	52	53

Degrees of Declination.

The Uſe of this Table of Amplitudes.

THE *Amplitude* is the Diſtance of Riſing or Setting of the Sun or Stars from the Eaſt or Weſt Points upon the Horizon.

And note; The Sun or Star having North Declination, they riſe to the Northward of the Eaſt, and ſet to the Northward of the Weſt: But if their Declination be South, they riſe to the Southward of the Eaſt, and ſet to the Southward of the Weſt: And by the Tables, is thus found:

Look the Latitude in the head of the Table, the Declination in the firſt Column on the left-hand, and in the common Angle of meeting, is the Amplitude deſired.

Example 1.

In the Latitude of 30 *d.* the Sun's-Declination being 7 *d.* 0 *m.* North; I demand the Amplitude?

Anſw. The Amplitude is 8 *d.* 6 *m.* for under Latitude 30 *d.* and againſt Declination 7 *d.* you will find 8 *deg.* 6 *min.* which is the Amplitude from the Eaſt Northward, at Sun-riſing; or from the Weſt Northward, at Sun-ſetting: But if the Declination had been 7 *d.* 0 *m.* South, in Latitude 30 *d.* as aforeſaid, then the Amplitude would have been 8 *d.* 6 *m.* from the Eaſt Southward at Sun-riſing, and 8 *d.* 6 *m.* from the Weſt Southward at Sun-ſetting. For if the Decli-

nation

nation be North, the true Amplitude will always be to the Northwards of the East or West: But if South, then to the Southwards.

If you have any odd Minutes of Declination, you muſt take the proportionable Part.

Example 2.

In the Latitude of 42 d. 30 m. the Sun's Declination being 12 d. 15 m; I demand the Amplitude?

Anſw. The Amplitude is 16 d. 43 m. found as follows;

According to the former Directions for the Latitude of 42 d. and Declin. { 12 / 13 } being d. the Amplitude is { 16 d. 16 m. / 17 d. 38 m.

Subtract, and their Difference is ——— 1 d. 22 m.

Then ſay; As 1 d. or 60 m. is to 1 d. 22 m. or 82 m. ſo is 15 m. to 20 m. found as here under:

If 60 m. ——— 82 m. ——— 15 m.

15

410
82

6(0)123(0(20 m. proportional Part.

0 30 Remainder.

Lat. 42 d. & Declin. 16 d. the Amplitude is 16 d. 16 m.
To it add proportional Part above ——— 0 d. 20 m.

Gives Amplit. for Declin. 12 d. 15 m. to be 16 d. 36. m.

D. M.

Again, for Lat. 43 d. and Dec. {12 / 13} d. Amp. is {16 30 / 17 54}

Subtracted, makes Difference to be ——— 1 24

Then ſay, As 60 m. is to 1 d. 24 m. or 84 m.
So is 15 m. to 21 m. found as here under:

If 60 m. ——— 84 m. ——— 15 m.

15

420
84

6(0)126(0(21 m. proportional Part.

06

00 Remainder.

Lat. 43 d. and Declin. 12 d. Amplitude is 16 d. 30 m.
To it add proportional Part above ——— 0 d. 21 m.
Gives for Declin. 12 d. 15 m. the Amplitude 16 d. 51 m.

Now becauſe the given Latitude 42 d. 30 m. is in the middle, between 42 d. and 43 d. therefore the Medium of the Amplitudes before found, is the Amplitude required, and is thus;

Lat. {42 / 43} d. Declin. 12 d. 15 m. the Ampl. is {16d. 36m. / 16d. 51m.}

Added together, is ——— 33d. 27m.
The ½ is the Amplitude required ——— 16d. 43m.

Thus

Thus may the Amplitude be found for any odd Minutes of Latitude, or Declination; though the Table is calculated for whole Degrees only.

By this Table the Variation of the Compaſs is moſt readily found: for by the Azimuth Compaſs find the Sun or Stars Magnetical-Amplitude, at their Riſing or Setting; and the true Amplitude (according to the Latitude of the Place, and their Declination) by this Table the Difference of theſe Amplitudes (when both are North, or both South), but their Sum (if one North, the other South) is the Variation.

But by the Rectifier it's moſt eaſily done thus;

Bring the Magnetical-Amplitude (on the upper Compaſs) right againſt the true (on the lower); then doth the North Point in the upper ſtand againſt the Variation in the lower; and the upper Compaſs is explained in all its parts by the lower.

Example 1.

Suppoſe the Magnetical-Amplitude at Riſing (found by the Azimuth-Compaſs) be Eaſt-Southerly 15 d. 30 m. and the true Amplitude (according to the Latitude of the Place, and Declination of the Object obſerved) be Eaſt-Southerly 26 d. 45 m; I demand the Variation of the Compaſs?

By the Rectifier.

Bring 15 d. 30 m. Eaſt-Southerly on the upper Compaſs, againſt 26 d. 45 m. Eaſt-Southerly on the lower; then doth the North-Point, on the firſt, ſtand

right againſt 11 d. 15 m. North-Eaſterly, on the latter; ſo that the Compaſs doth vary 11 d. 15 m. or one Point Eaſt.

Example 2.

True Magnet. } Ampl. { 07 d. 0 m. Eaſt-Northerly. / 15 d. 30 m. Eaſt-Southerly.

Idem and the Variation of the Compaſs.

By the Rectifier.

Bring 15 d. 30 m. Eaſt-Southerly on the upper Compaſs, againſt 7 d. Eaſt Northerly on the lower; then North, on the firſt, ſtands againſt 22 d. 30 m. North-Weſterly; that is, 22 d. 30 m. or 2 Points Variation Weſt.

AN

AN APPENDIX,

Containing the Uſe of

Inſtruments,

Moſt uſeful in

NAVIGATION.

The Deſcription and Uſe of the Fore-ſtaff, *or* Croſs-ſtaff.

THE *Foreſtaff*, ſo called from the Poſſiture of the Obſerver in uſing it, whoſe Face is towards the Thing obſerved, generally; though for the Sun it's ſo contrived (for preſerving the Eye) to be uſed backward: it's called a *Croſs-Staff* from its Form, being a ſquare Staff with 3 or 4 pieces a-croſs it, which are called *Croſſes*.

The Staff is uſually about 30 Inches, or 3 Feet long, and more than half an Inch ſquare, having four ſides, each graduated unequally like a Scale of Tangents; to each of them belongs a diſtinct Croſs: though ſometimes the ſhorteſt Croſs is made to ſerve two ſides of the Staff; that is, the Breadth is for the Ten-Croſs, and Length for the Thirty-Croſs: beſides this, it hath 2 Croſſes more, the longeſt is the Ninety-Croſs, the other the Sixty-Croſs; theſe 4 Croſſes are thus to be underſtood; The

		d.		d.
10		3		10
30	Croſs, belongs to that	10	and ending at	30
60	ſide beginning at	20		60
90		30		90

The Uſe of the Fore-ſtaff.

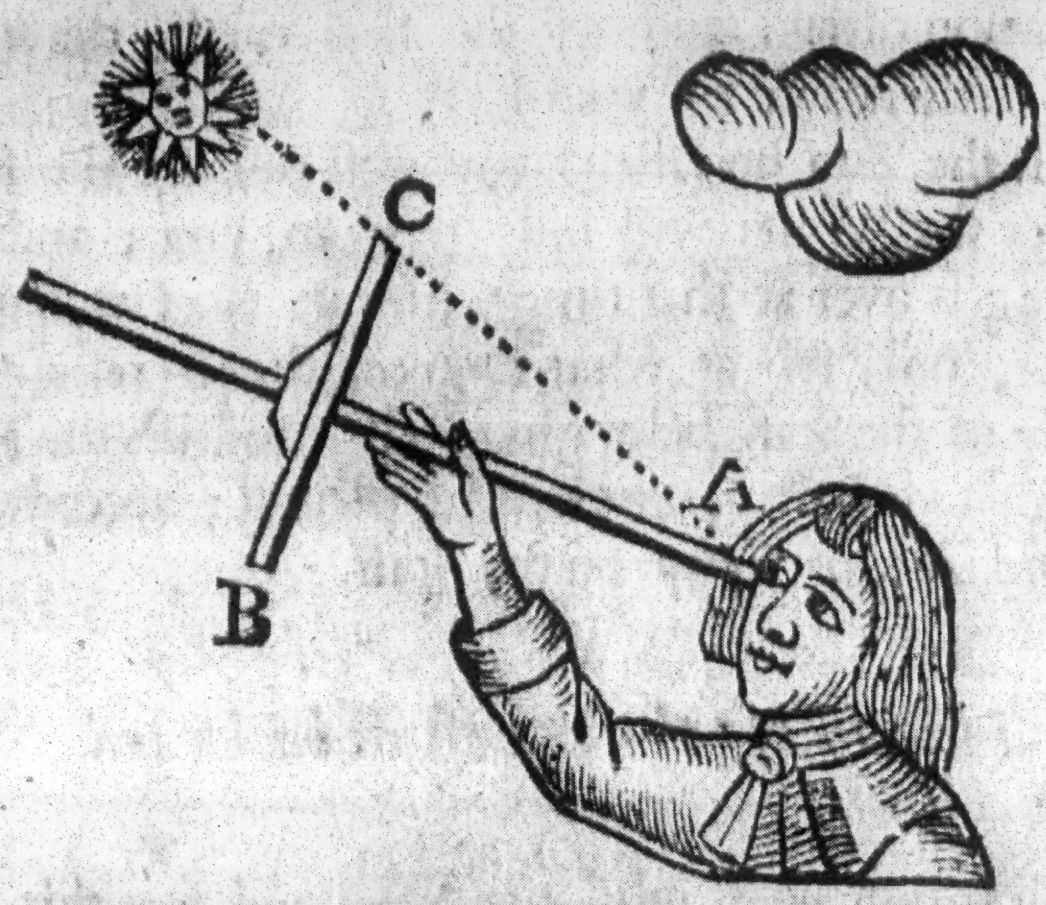
IT's common and ordinary at Sea, to take the Meridian-Altitude of the Sun or Stars with this Inſtrument, and by it find the Latitude they are in. To perform which, take notice of theſe Precepts following:

1. Note; the 10, 30, 60, and 90 Croſſes, are to be uſed according as the Meridian-Altitude is more or leſs; that is, if leſs than 10 d. uſe the 10 Croſs; if between 10 and 30 d. uſe the 30 Croſs; if between 30 and and 60 d. the 60 Croſs; if more than 60 d. uſe the 90 Croſs.

2. Having conſidered which Croſs (according to the judged Altitude of the Object intended to be obſerved)

ſerved) is ſutable, put it on the Staff ſo, that the flat ſide of the Croſs may be towards the flat end of the Staff: Then,

The Figure of the *Fore-ſtaff.*



3. Hold the flat end of the Staff (as A) to the corner of your Eye; there let it reſt upon your Eye-bone, as near the corner of your Eye as you can, ſo it doth not hinder your Sight.

4. Then look to the upper end of the Croſs (as at C) for the Sun, and at the lower end (at B) for the Horizon.

5. But if, at the lower-end of the Croſs, you ſee all Sky and no Water, then draw the Croſs a little nearer to your Eye.

6. If, on the contrary, you ſee all Water and no Sky, then ſlide the Croſs a little farther from you.

7. Then if you ſee the Center of the Sun at the upper-end of the Croſs, and the Horizon at the lower-end, the Croſs ſtands as it ought.

8. Wait till the Sun be on the Meridian, making Obſervation often: and as the Sun riſeth, draw the Croſs a little nearer to your Eye.

9. If the Sun be fallen, you will not ſee the Horizon, for the Water will hide it from you; and then obſerving is over at that time: ſtir not the Croſs out of its place, only ſee at what *Degree*, &c. it reſteth, on that ſide of the Staff belonging to it; and it's the Meridian-Altitude, or Complement thereof; according to the word *Alt.* or *Comp.* on the Staff.

How to uſe the Foreſtaff *backward.*

THis is only uſed with the Sun, and for this purpoſe the Ten-Croſs hath another piece of Wood or Ivory, put croſs it; ſo that the lower edg of this croſs piece lieth even with the middle of the ſquare Hole in the Ten-Croſs; which alſo anſwers to the middle of the Thickneſs of the Staff.

There is a Plate of Braſs with a hole in it, and ſo fitted, that it will ſlide off and on the Ends of the 90, 60, or 30 Croſſes: theſe two things added to a Fore-ſtaff, make it fit for a backward Obſervation of the Sun; which is thus:

1. A-

1. According as the Meridian Altitude of the Sun is more or leſs, ſo uſe the 90, 60, or 30 Croſs; putting it on the Staff, the flat end of it even with the flat end of the Staff, there ſcrew it faſt; and at one end of the Croſs, ſlip on the foreſaid Braſs Plate, ſo as to leave a ſlit ſight through it, near the lower-end of the Croſs.

2. Put the Ten-Croſs (having a croſs piece on it) on the Staff, the flat ſide of it towards the other Croſs, at the Staff's-end.

3. Turn your back to the Sun; Look through the ſlit-ſight, at the lower end of the Croſs, for the Shadow of the upper-end, lying on the Ten-Croſs, in the Line anſwering the middle of the Staff, and on each ſide of the Staff.

4. At the ſame time, the Horizon ſhould be ſeen (through the foreſaid Slit) to lie even with the Shadow on the middle Line, in the Ten-Croſs, at each end of it, on both ſides the Croſs.

5. In looking through the ſlit Sight, you ſee the Shadow on the middle Line; but inſtead of the *Horizon* you ſee only *Water* there: then draw the Ten-Croſs nearer, till the Shadow and Horizon agree or meet in the ſaid middle Line.

6. On the contrary, looking as before, inſtead of the *Horizon*, you ſee *Sky* meet the Shadow, on the middle Line; then put the Ten-Croſs from you, till you ſee the Horizon and Shadow meet at the Line.

7. Continue obſerving till the Sun be at the higheſt; and as the Sun riſeth, you muſt draw the Ten-Croſs nearer, in order to keep the Horizon and Sha-

Shadow together on the middle Line of it.

8. If the Sun be fallen, (after you have continued obſerving as before directed) the Horizon will lie below the Shadow, on the middle Line; then is the Obſerving finiſhed at that time: ſtir not the Ten-Croſs out of its place; for where it now ſtands, on that ſide of the Staff belonging to the Croſs, at the end of it is the Sun's Meridional Altitude, or Complement thereof, as before in obſerving forward.

Thus I have ſhewed how to take an Obſervation by the Croſs-ſtaff, and that both forward and backward. The next thing in courſe will be to ſhew how to work your Obſervation; which to do, take notice of theſe following Rules.

To work an Obſervation.

1. IF the Sun or Star hath North-Declination, and be on the Meridian to the Southwards of you, ſubtract the Declination from the Meridian Altitude, and the Remainder is the height of the Equinoctial or Complement of the Latitude North.

2. But if the Object obſerved hath South-Declination, add, the Sum (if it exceed not 90 d.) is the Height of the Equator, or Complement of the Latitude North: If it doth, ſubtract 90 d. from it, the Remainder is the Latitude South.

3. If the Object hath North-Declination, and be on the Meridian to the Northwards; add the Declination to the Meridian Altitude, the Sum (if it exceed

ed not 90 d.) is the Height of the Equator, or omplement of the Latitude South: But if it doth xceed 90 d. ſubtract 90 d. from the ſaid Sum, the Remainder is the Latitude North.

4. If the Sun hath South-Declination, and be to e Northwards at Noon, ſubtract the Declination from s Meridian Altitude, the Remainder is the Complement of the Latitude South.

5. When the Sun hath no Declination, the Meridian ltitude is the Complement of the Latitude North; if outh, at Noon; and the contrary.

6. If the Sun be in the Zenith, and at the ſame me he hath no Declination, you are under the E-uinoctial.

7. But if the Sun hath North or South-Declination, nd in the Zenith; the Declination is the Latitude you e in, North or South.

8. If you obſerve Sun or Star upon the Meridian, eneath the Pole, add the Meridian Altitude to the omplement of the Sun or Star's Declination; the um is the Height of the Pole, or Latitude of the lace.

These 8 Rules are explained by the Examples following.

Exam-

Examples for working an Obſervation in North Latitude.

Example 1.

ADmit, at Sea, I obſerve the Sun's Meridian Altitude to be 42 d. 20 m. South; and the ſame time the Sun's Declination is 10 d. 10 m. North; I demand theLatitude I am in?

	d.	m.	
The Meridian Altitude	42	20	South
The Declination — ſubt.	10	10	North
The Complement of the Latitude	32	10	
Subtract it from	90	00	
The Latitude I am in, is	57	50	North

Example 2.

Being at Sea the 22*d* of *May*, *Anno* 1692, I find the Sun's Meridian Altitude to be 65 d. 10 m. South I demand the Latitude?

	d.	m.	
The Meridian Altitude	65	10	South
The Declination — ſubt.	22	15	North
The Complement of the Latitude	42	55	
Subtract it from	90	00	
The Latitude I am in, is	47	05	North

Exam

Example 3.

At Sea the 27*th* Day of *November*, *Anno* 1695, I find the Sun's Meridian Altitude to be 26 deg. 0 min. South; I demand the Latitude I am in?

	d.	m.	
The Meridian Altitude ———	26	30	South.
The Declination ——— add	22	44	South.
The Complement of the Latitude —	49	14	
Subtract it from ———	90	00	
The Latitude I am in, is ———	40	46	North.

Example 4.

At Sea the 25*th* of *April*, *Anno* 1693, I find the Sun's Meridian Altitude, by obſervation, to be 58 d. 45 m. South; I demand the Latitude I am in?

	d.	m.	
The Meridian Altitude ———	85	45	South.
The Declination ——— ſubt.	16	31	North.
The Complement of the Latitude —	42	14	
Subtract it from ———	90	00	
The Latitude I am in, is ———	47	46	North.

Example 5.

Admit, the 12*th* Day of *June*, *Anno* 1697, I find the Sun's Meridian Altitude, by Obſervation, to be 80 d. 35 m. North; I demand the Latitude I am in?

The

	d.	m.	
The Meridian Altitude	80	35	North
The Declination — add	23	31	North
The Sum exceeds 90 deg.	104	00	
From it subtract	90	00.	
The Latitude I am in, is	14	06	North

Example 6.

Admit, *August* 22, 1699, the Sun's Meridian Altitude was observed to be 85 d. 15 m. North; I demand the Latitude of that Place?

	d.	m.	
The Meridian Altitude	85	15	North
The Declination — add	08	17	North
The Sum exceeds 90 d.	93	32	
Therefore from it subtract	90	00	
The Latitude of that Place, is	3	32	North

Example 7.

Admit, in a Ship at Sea, *June* 20, 1695, the Sun's Meridian Altitude was 66 d. 45 m. North; I demand the Latitude the Ship is in?

	d.	m.	
The Meridian Altitude	66	45	North
The Declination — add	23	15	South
The Complement of the Latitude	90	00	
Subtract it from	90	00	
The Ship is under the Equinoctial	0	00	

Exam-

Examples to find the Latitude, by obſerving the Stars.

Example 1.

ADmit, at Sea, I obſerve the *Bull's-Eye* upon the Meridian, and find his Meridian Altitude to be 50 d. 30 m. South; I demand the Latitude I am in?

		d.	m.	
The Declination of this Star, the *Bull's-Eye*, is		15	46	North.
The Meridian Altitude of the Star		50	30	South.
The Declination	ſubt.	15	46	North.
Complement of the Latitude, is		34	44	
Subtract it from		90	00	
The Latitude I am in, is		55	16	North.

Example 2.

Admit I obſerve the bright Star in the Great Dog's-Mouth, and I find his Meridian Altitude to be 35 d. 45 m. South; I demand the Latitude I am in?

		d.	m.	
The Declination of the Great Dog's Mouth, is		16	15	South.
The Meridian Altitude of the Star		35	45	South.
The Declination	add	16	15	South.
The Height of the Equator, is		52	00	
Subtract it from		90	00	
The Latitude I am in, is		38	00	

Exam-

Examples for working an Obſervation in South Latit.

Example 1.

ADmit in a Ship at Sea the 10*th* Day of *May*, *Anno* 1694, I find the Sun's Meridian Altitude, by Obſervation, to be 62 d. 00 m. North; I demand the Latitude the Ship is in?

		d.	m.	
The Meridian Altitude		62	00	North.
The Declination	add	20	08	North.
The Complement of the Latitude		82	08	
Subtract it from		90	00	
Latitude the Ship is in, is		7	52	South.

Example 2.

Admit, in a Ship the 15*th* Day of *January*, *Anno* 1692, in Longitude 150 d. Eaſt, I find the Meridian Altitude, by Obſervation, to be 58 d. 45 m. North; I demand the Latitude the Ship is in?

The Declination in the Meridian of *London*, for the 15*th* of *January*, is 18 d. 57 m. the daily Difference at this time is 15 m. decreaſing; therefore (in the Table of Proportion) you will find the proportional Minutes to be 6 m. which add to the Declination in the Meridian of *London*, the Sum is 19 d. 3 m. South; the true Declinarion for the Longitude of 150 d. Eaſt.

The Meridian Altitude		58 d.	45 m.	N.
The Declination	ſubt.	19 d.	03 m.	S.
Complement of the Latitude, is		39	42	
Subtract it from		90	00	
Latitude the Ship is in, is		50	18	S.

Exam.

Example 3.

Admit, being at Sea the 12*th* Day of *July*, *Anno* 1693, I find the Sun's Meridian Altitude to be 66 *d.* 52 *m.* North; I demand the Latitude?

	d.	*m.*	
The Meridian Altitude	66	52	North.
The Declination — add	20	14	North.
Complement of the Latitude, is	87	06	
Subtract it from	90	00	
The Latitude required	2	54	South.

Example 4.

A Ship at Sea, the Sun's Declination being 15 *d.* 30 *m.* South; and the Sun's Meridian Altitude 80 *d.* 45 *m.* South; I demand the Latitude the Ship is in?

Anſw. 6 *d.* 15 *m.* South.

Example 5.

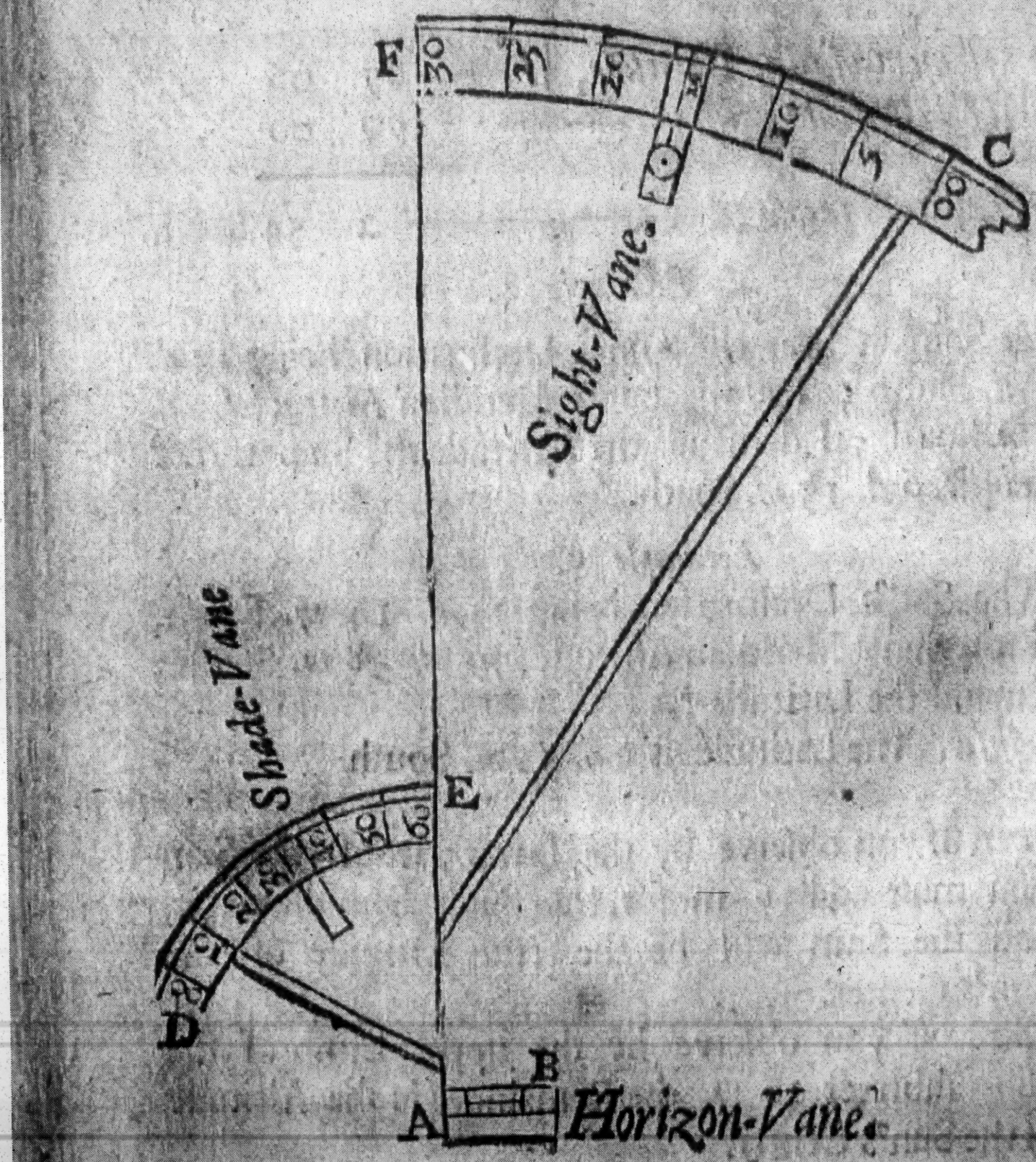
The Sun's Declination being 11 *d.* 14 *m.* South, and the Sun's Meridian Altitude 79 *d.* 38 *m.* South; demand the Latitude?

Anſw. The Latitude is 0 *d.* 52 *m.* South.

Note 1. If you obſerve by the lower part of the Sun, you muſt add 16 *m.* for the Sun's Semidiameter, and the Sum will be the true Altitude of the Sun's Center.

Note 2. If you obſerve by the upper Limb of the Sun, ſubtract 16 *m.* the Remainder is the Altitude of the Sun's Center.

The Figure of the QUADRANT.



The *Description* and *Use* OF THE Quadrant.

The Description of Davis's *Quadrant.*

THIS Instrument, called a *Quadrant*, first invented by our Country-man, Capt. *Davis*, and thence called *Davis*'s Quadrant, is of a very commodious Form; at present, the most general approved Instrument at Sea, for observing the Sun's Meridian Altitude.

The Form of it (is as in the Figure annexed) may be of any Radius, and are made of any Length between 18 *Inches* and 3 *Feet*; but the most general now made, are *QUADRANTS of 26 Inches Radius, with one Arch 65 Degrees, the other 25, and a Glass in the shadow-Vane.*

The principal Parts are 3 Vanes, and 2 Arches; on which Arches are the Degrees, both together making 90 *Degrees*; from whence it hath the Denomination of a *Quadrant*.

Of the 3 Vanes.

The *Horizon-Vane* (marked in the foregoing Figure AB, and with its Name) reſpects the Horizon in time of obſerving; that which gives the Shadow, is named the *Shadow-Vane*; and that through which you are to look for both Shadow and Horizon, is termed the *Sight-Vane*: all theſe are noted in the Figure by their Names.

Of the 2 Arches.

The leſſer noted DE, is called the *60th Arch*, becauſe it did heretofore contain no more, and is ſo numbred in the Figure; but now it often contains 65, and ſometimes 70 Degrees: this Arch is of a ſmall Radius, being ſo deſigned, that the *Shadow-Vane* uſed on it, being at ſo ſmall a Diſtance from the *Horizon-Vane*, on which its Shadow (in time of obſerving) is to fall, might be more viſible to the Eye of the Obſerver.

This *little Arch* is divided ſometimes but to every 5 Degrees, and never leſs than every ſingle Degree; it's numbred from the upper end D, with 5, 10, 15, 20, *&c.* downwards to E, where it ends in the Line AEF, (a Line in the middle of the longer *Leg* of the *Quadrant*) at *60*, *65*, or 70 *Degrees*, according as the other Arch is divided; ſo that the Numbers at E and F together, ever muſt make *90 d.*

The *greater Arch* CF, is called the *30th* Arch; it's of a large Radius, that it might contain the leſſer Subdiviſions of a Degree; and being of a compe-

tent

tent Breadth, thereon uſually are deſcribed 10 *Concentrick Circles*, interſected with 3 Diagonal-Lines in each Degree, making each Interſection 2 Minutes.

This *great Arch* is divided on the Limb into Degrees by long Stroaks; each again ſubdivided into 6 equal parts by ſhorter Stroaks; each ſmall Diviſion being 10 Minutes, and are numbred from the lower end C, with 5, 10, 15, *&c.* upward to F, where it ends in the Line A, E, F, at 20, 25, or 30 Degrees: the Figures at F and E, always together, muſt make 90; as in the Figure are 30 and 60.

The Uſe of the Quadrant.

THis Inſtrument is rarely uſed otherwiſe than to obſerve the Sun's Meridian Altitude; which to perform, I thus deſcribe.

1. Put the *Horizon-Vane* A B, on the end A, and home to the Center A; the *Sight-Vane* put on the Arch C F, cloſe to the back of it; the *Shadow-Vane* on the little Arch D E, home to the back of it, and the upper edg of the Vane ſet to a number of Degrees leſs than the Complement of the Altitude by 15 or 20 Degrees.

2. The Vanes being thus fixed upon the *Quadrant*, turning your Back towards the Sun, the end C in your Hand, and F uppermoſt, look through the *Sight-Vane*, cauſing the upper edg of the Shade of the *Shadow-Vane* to lie upon the upper edg of the Slit in the *Horizon-Vane*, where is drawn a black Line:

at the ſame time, if the *Horizon* appear through the ſaid Slit in the *Horizon-Vane*; the Vanes on the Quadrant ſtand at the Sun's preſent Altitude.

3. But if the Sky appear inſtead of the Horizon, ſlide the Sight-Vane a little higher towards F: on the contrary, if the Sea appear inſtead of the Horizon, then ſlide the Sight-Vane lower towards C; continue ſo to do, till the Horizon appear through the Horizon-Vane.

4. In order to obtain the Meridian Altitude, (which is the greateſt the Sun will have that Day, and the thing uſed to find the Latitude) continue obſerving; and as the *Sun* riſes, the Sea will appear through the *Horizon-Vane*; and the Sight-Vane muſt be ſlid lower accordingly: thus do, obſerving as often as may be convenient, till the Sun is at the higheſt.

5. When the Sun begins to fall, the Sky will appear (through the *Horizon-Vane*) inſtead of the *Horizon*, then deſiſt obſerving for that Day.

6. Having thus done, add the Degrees the upper-edg of the Shadow-Vane ſtandeth at, to the Degrees and Minutes cut by the in-ſide of the Sight-Vane, their Sum is the Complement of the Sun's Meridian Altitude, or the Diſtance of the upper edg of the Sun from the Zenith; to which Sum, add 16 *m.* the Sun's Semidiameter; and this laſt Sum is the Diſtance of the Sun's Center from the Zenith, being the true complement of the Sun's Meridian Altitude.

Note;

Note; The upper-edg of the Shade of the Shadow-Vane, reſpects the upper limb of the Sun; and the lower-edg of the ſaid Shade, anſwers to the lower-limb of the Sun: ſo that obſerving by the firſt, you are to add 16 *m.* On the contrary, obſerving by the latter, ſubtract 16 *m.* to, or from what's on the *Quadrant*; the Sum, or Difference, is the Diſtance of the Sun's Center from the Zenith; called his *Zenith-Diſtance*, or Complement of his Meridian Altitude.

Thus I have ſhewed how to take an Obſervation with the *Quadrant*; I come now to ſhew how to work it. The Difference in working an Obſervation taken by the *Fore-ſtaff* and the *Quadrant*, is only this: By the *Fore-ſtaff* you take the Altitude, by the *Quadrant* the complement of the Altitude, or the Diſtance of the Sun from the *Zenith*: Altitude is the Diſtance of the Sun from the *Horizon*; therefore if you ſubtract the Complement of the Altitude from 90 *d.* the Remainder is the Altitude, which you may uſe as in the Uſe of the *Fore-ſtaff*.

But it is uſual to work Obſervations (made by the Quadrant) by the Complement of the Sun's Meridian Altitude; I will therefore give ſome general Rules, and ſome particular Examples for their Explanation.

The general Rules are:

1. IF the Sun hath North-Declination, and upon the Meridian to the Southwards; add the *Sun's Declination* to the *Zenith-Diſtance*, (or Complement of the Sun's Meridian Altitude) the Sum is the Latitude you are in, North.

2. If the Sun be to the Southward of you, and hath South-Declination, ſubtract the *Sun's Declination* from the *Zenith's Diſtance*, the Remainder will be the Latitude you are in, North: But if the Declination exceed the Zenith-Diſtance, ſubtract the leſſer from the greater, and the Remainder is the Latitude South.

3. If the Sun be to the Northward of you, and hath South Declination; add the Sun's Declination to his Zenith Diſtance, the Sum will be the Latitude you are in the South.

4. If the Sun be to the Northward of you, and hath North-Declination; ſubtract the Sun's Declination from his Zenith Diſtance, the Remainder will be the Latitude South: But if the Declination exceed the Zenith Diſtance, ſubtract the leſſer from the greater, and it gives the Latitude South.

I might have been larger in giving more general Rules; but if you underſtand thoſe 8 Rules for the Uſe of the *Fore-ſtaff*, you cannot err in theſe, uſing the *Quadrant*: And for their explanation, the Examples follow.

The

The Rules explained by Examples of obſerving in North Latitude.

Example 1.

ON the 10*th* of *April* 1692, being at Sea, the Sun came to the Meridian in the South; and by Obſervation, found his *Zenith-Diſtance*, or *Complement of his Meridian Altitude*, to be 34 *d.* 47 *m.* that is, his upper limb was ſo much from the *Zenith*: I demand the Latitude of the Place of Obſervation?

		d.	*m.*	
Complement of Meridian Altitude ——		34	47	
The Sun's Semidiameter ——	add	0	16	
Diſt. of the Sun's Center from Zen. —		35	3	South.
Declination North ——	add	11	55	North.
Latitude of the Place required ——		46	58	North.

Example 2.

Being at Sea the 14*th* Day of *Auguſt*, *Anno* 1692, I find the Complement of the Sun's Meridian Altitude, *by Obſervation*, to be 28 *d.* 48 *m.* South; I demand the Latitude the Ship is in?

Com-

		d.	m.	
Complement of Meridian Altitude	—	28	48	South.
Sun's Semidiameter	add	0	16	
Dist. of the Sun's Center from Zen.	—	29	4	South.
The Declination	add	10	52	North.
Latitude the Ship is in,		39	56	North.

Example 3.

Being at Sea *September* 13, 1694, I find the Complement of the Sun's Meridian Altitude, *by observation*, to be 47 *deg.* 35 *min.* South; I demand the Latitude I am in?

		d.	m.	
Complement of Meridian Altitude	—	47	35	
Sun's Semidiameter	add	0	16	
Dist. of Sun's Center from Zenith	—	47	51	South.
The Declination	subt.	0	13	South.
Latitude the Ship is in,		47	38	North.

Example 4.

In a Ship at Sea the 5*th* Day of *November*, *Anno* 1693, I find the Complement of the Sun's Meridian Altitude, *by observation*, to be 52 *deg.* 0 *min.* South; I demand the Latitude the Ship is in?

Coin-

		d.	m.	
Complement of Meridian Altitude		52	0	
Sun's Semidiameter	add	0	16	
Dist. of Sun's Center from Zenith		52	16	South.
The Declination	subt.	18	45	South.
Latitude the Ship is in		33	31	North.

Example 5.

Being at Sea the 27*th* of *May*, 1692, the Sun to be Northward of me; and the Complement of his Meridian Altitude, by Observation, to be 10 *d.* 15 *m.* I demand the Latitude the Ship is in?

	d.	m.	
Sun's Declination	22	49	North.
Complement of Meridian Altitude	10	15	
The Sun's Semidiameter	add 0	16	
The true Zenith distance	subt. 10	31	North.
Latitude the Ship is in	12	18	North.

Example 6.

Admit, being in a Ship at Sea the 29*th* Day of *June*, *Anno* 1695, the Sun upon the Meridian, I find, by Observation, the upper limb of the Sun is 6 *d.* 42 *m.* to the Northward of my Zenith; I demand the Latitude I am in?

Sun's

	d.	m.	
Sun's Declination	22	26	North
Sun's Semidiameter — add	0	16	
Sun's ſupreme Marg. diſt. from Zen.	6	42	
Diſt. of Sun's Center from Zen. ſubt.	6	58	North
Latitude the Ship is in	15	28	North

Example 7.

Being at Sea the 21*ſt* of *July*, *Anno* 1694, in Longitude 165 *d.* Weſt, and the Sun being upon the Meridian, I find, by Obſervation, the ſupream Margin of the Sun is 16 *d.* 45 *m.* to the Northward of my Zenith; I demand the Latitude the Ship is in?

	d.	m.	
The Declination	18	15	North
Proportional Minutes — ſubt.	0	6	
Sun's Declination in the Merid. given	18	9	North
Sun's ſupreme Marg. Diſt. from Zen.	16	45	
Sun's Semidiameter — add	0	16	
Sun's Center diſtant from Zenith	17	1	North.
Latitude the Ship is in	1	8	North

The

The Rules explained by Examples of Obſervation in South Latitude.

Example 1.

N a Ship at Sea the 15*th* Day of *July*, *Anno* 1691, in Longitude 150 *d.* Eaſt, and the Sun being up the Meridian, I find the Complement of his Meridian Altitude, by Obſervation, to be 48 *d.* 28 *m.* orth; I demand the Latitude the Ship is in?

		d.	*m.*	
mplement of Merid. Latitude ——	48	28	
n's Semidiameter —— ——	add	0	16	
n's Center diſtant from Zenith ——	48	44	North.
be Declination —— ——	ſubt.	19	47	North.
atitude the Ship is in —— ——	28	57	South.

Example 2.

At Sea the 25*th* of *October*, *Anno* 1693, in Longitude 120 *d.* Weſt, and the Complement of the un's Meridian Altitude, by Obſervation, is 27 *d.* 29 *m.* North; I demand the Latitude the Ship is in?

		d.	*m.*	
Complement of Merid. Altitude ——	27	29	
un's Semidiameter —— ——	add	0	16	
un's Center from the Zenith ——	27	45	North.
The Declination —— ——	add	15	46	South.
titude the Ship is in —— ——	43	31	South.

Exam-

Example 3.

Admit being in a Ship at Sea the 25*th* of *Decem-ber*, *Anno* 1694, I find the Sun upon the South-part of the Meridian, and, by Obſervation, the complement of the Sun's Meridian Altitude 15 *d.* 10 *m.* I demand the Latitude the Ship is in?

		d.	*m.*	
Complement of Meridian Altitude		15	10	
Sun's Semidiameter	add	0	16	
Sun's Center from the Zenith	ſubt.	15	26	South
The Declination		22	45	South
Latitude the Ship is in		7	19	South

Thus much I thought neceſſary to add by way of explanation of the foregoing Rules, which ſhew the perfect way of obſerving; that is, how to take and work an Obſervation with more exactneſs than hath been formerly uſed.

Note 1. The Sun's Semidiameter, here added to the Complement of its Meridian Altitude, may be contrived ſo on the Quadrant, that its Addition by the Pen may be omitted; for this purpoſe the Quadrants made by *James Atkinſon* at Cherry-Garden-ſtairs on *Rotherith-wall*, have on the back-edg of the little Arch, every 5 *d.* numbred, differing from thoſe on its flat-ſide, the Semidiameter of the Sun: So that by placing the upper-edg of the Shadow Vane to the

Degrees

Degree on the foreſaid back-edg of the Arch, the Quadrant then ſheweth the true Complement of the Altitude, or the Diſtance of the Sun's Center from the Zenith; which prevents adding *16 m.* after obſerving.

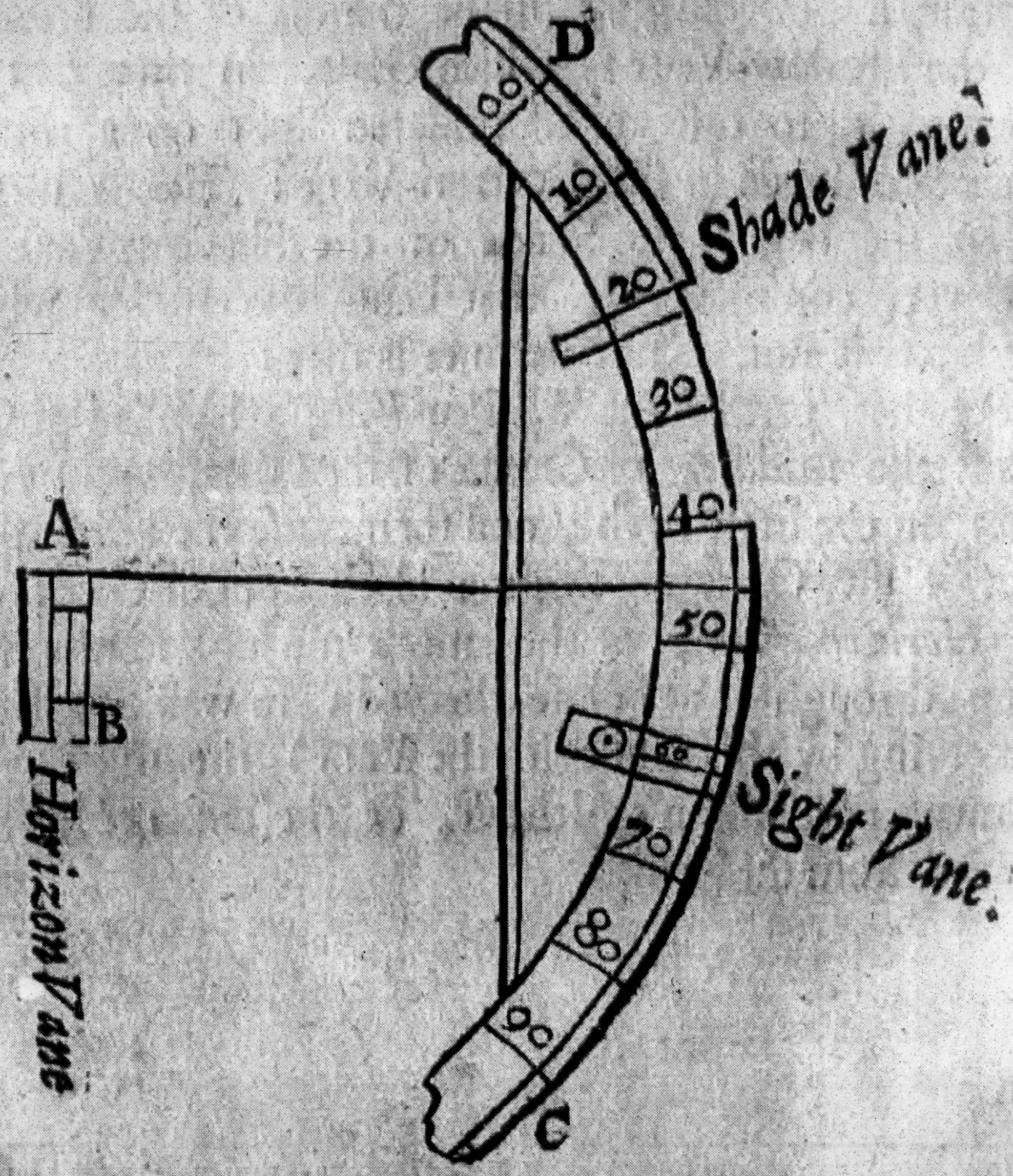
2. There is another Contrivance of late, which is putting a Convex-glaſs in the middle of the breadth of the ſhadow-Vane; which Glaſs, in time of obſerving, is to caſt an illuminated Spot on a round black Spot made in the Horizon-Vane: This is uſeful when the edg of the Shade of the Shadow-Vane is not very conſpicuous; that being diſcernable when the latter is not. The manner is thus:

Set that part of the *Shadow-Vane* which is right againſt the middle, or Center of the Glaſs, to the Degrees on the little Arch; and then cauſe the inlightned Spot of the Glaſs to lie on a black Spot or Circle on the *Horizon-Vane*; at the ſame time look for the Horizon through it as before directed; ſo will you have (obſerving by this Glaſs in the Vane) the true Complement of the Sun's Altitude, or the Diſtance of his Center from the Zenith.

The

The Figure of the

BOW.



The Deſcription and Uſe of the BOW.

The Deſcription of the Bow.

1. THIS Inſtrument conſiſteth of two parts, (making the Figure A C D) beſides the 3 Vanes which are the ſame for kind with thoſe uſed with the Quadrant: The Parts are the Arch C D, and the Radius A E; this latter ſlips in a Socket, ſo as to be taken out for convenience, to lay in a little room.

2. The 3 Vanes are the ſame as before deſcribed in the Quadrant, and their Names are inſerted in the Figure of the Bow annexed.

3. The Degrees are numbred from the upper-end of the Arch D, downwards towards the lower-end C; thus, 5, 10, 15, &c. as in the Figure: The Uſe of it follows.

The Uſe of the Bow.

1. TAke the lower-end of the Bow C in your Hand, (after the Vanes are placed according to the Directions before in uſing the Quadrant) holding it upright; look through the *Sight-Vane*, cauſing the upper-edg of the Shade of the Shadow-Vane, to lie on the upper-edg of the Slit in the Horizon-Vane; and at the ſame time look for the Horizon through it; ſliding the Sight-Vane higher or lower, (as directed in the Uſe of the Quadrant) till

the Shadow and Horizon meet together on the Horizon-Vane.

2. Continuing your Observation (as with a Quadrant) till the Sun be at the highest; and when he is fallen, you may know it thus; Keeping the Shadow on the Slit of the *Horizon-Vane*, and looking through it, you see the *Sky* instead of the *Horizon*; the Sun is then fallen, and your Observing for that Day is over.

3. Then count the Degrees intercepted between the Sight and Shadow-Vane, (that is, from the upper-edg of the Shadow-Vane, to that part of the Sight-Vane right against the middle of the Eye-hole in it) they shew the Sun's Altitude: or thus; Subtract the Degrees at the Shadow-Vane, from those at the (light of the) Sight-Vane, the Remainder is the Sun's Altitude, or Distance of his upper-limb from the Horizon; from which, subtract 16 Minutes, so have you the Altitude of his Center: but if the Shadow-Vane have a Glass in it, and the Observation be made by it, (as before directed, in its using with a Quadrant) the Instrument sheweth the true Altitude, without the Subtraction of 16 Minutes for the Sun's Semidiameter.

To find the Latitude in Observing by the Bow.

The same Rules given in observing by the Forestaff, are to be followed here; or subtract what the Bow sheweth from 90 *d.* and then the Rules for the Quadrant are to be observed, in order to find the Latitude.

The

The Deſcription and Uſe of the NOCTURNAL.

The Deſcription.

1, THE *Nocturnal* conſiſts of 3 Parts; the firſt, termed the unmoveable Part, is the broadeſt and greateſt; to which, is a Handle to hold it by in time of Obſervation.

On the fore-ſide of which, in the outermoſt Circle, are the 12 Months, and each Month ſubdivided into its reſpective Days, or at leaſt every two Days: They are counted towards the Right-hand; marked with their Names or the firſt 3 Letters thereof; as *Jan.* for *January*, *Feb.* for *February*, *Mar.* for *March*, &c. Within the Circle of Months, is a Circle divided into 24 equal Parts or Hours, each Hour divided into Halfs and Quarters, uſed to find the time of *Full-ſea* or *High-water*.

On the back-ſide of this part, are the 32 Points of the Compaſs, *South* uppermoſt, and *Eaſt* on the Left-hand; to each Point is ſet the declination of the *North-Star*, above, or under the Pole; which is known by *Und.* for *Under*, and *Abo.* for *Above*.

There have formerly been made two ſorts of *Nocturnals*, one for the *Great-Bear*, the other for the *Little-Bear*: Thoſe made for the Guards of the

Great-Bear, or *Charles's-Wain*, commonly called the 2 *Pointers*, have *February* at the top: But thoſe made for the Guards of the *Little-Bear*, have *April*: But they are now made for both *Bears* in one *Nocturnal*; and are known by having, either 2 Circles of Months, marked G B, and L B, or 2 ſhort Teeth or Indexes, proceeding from the ſecond or middle part of it.

2. The ſecond moveable or middle Part, hath 2 Circles on it; the outermoſt is divided into the 29 Days and $\frac{1}{2}$ of the *Moon's Age*; the innermoſt into 24 equal Parts or *Hours*, each *Hour* ſubdivided into *Halfs* and *Quarters*: this part hath a Tooth or ſhort Index proceeding from it, with the edg continued in a right-line from the Center; which is to be ſet to the Day of the Month when uſed: ſome have 2, marked G on one, and L on t'other; G ſtanding for *Great-Bear*, and L for *Little-Bear*; ſignifying the Nocturnal is made for both Bears, and may be uſed for either.

3. The third and moveable Part, is called the *Index*, its uppermoſt on the fore-ſide of the Inſtrument, having one edg proceeding in a right-line from the Center, which (in time of Obſervation) muſt be turned to the Guards; Through all 3 pieces, in the Center of the Inſtrument, is a *Hole*, through which you are to ſee the *North-Star*, when the Index is turned to the Guards.

The

The manner of uſing the Nocturnal.

BY it may be found the Hour of the Night, the Bearing of the Guards, and the Declination of the *North-Star* from the Pole; by which may be found the Latitude, as ſhall be ſhewed in order.

1. *To find the Hour of the Night.*

1, Place the Index of the ſecond, or middle Piece, to the Day of the Month, where it's to be kept till the Obſervation is ended: Then, taking the Handle in your Hand, with the fore-ſide towards you,

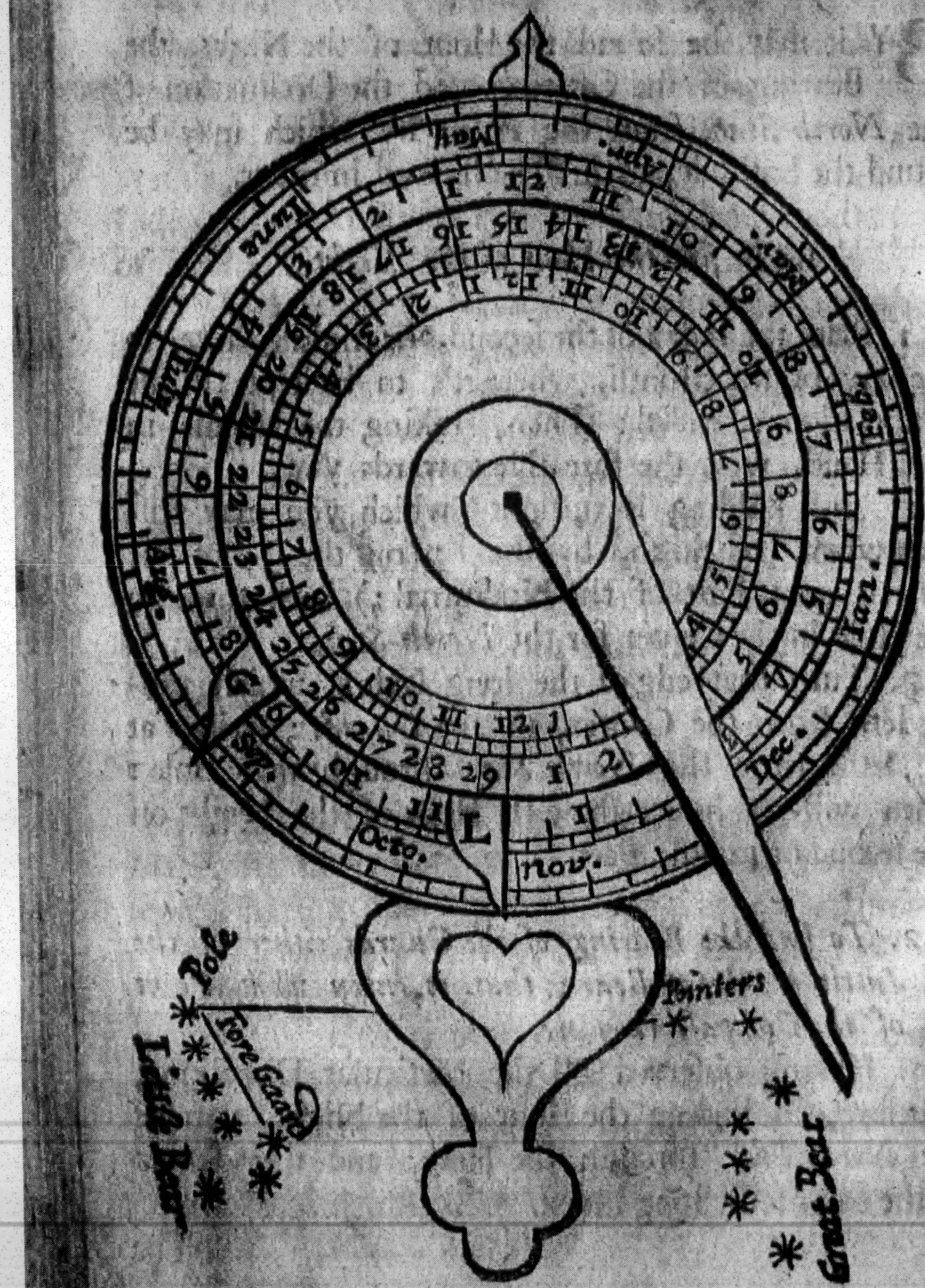
2. And holding it upright (which you may diſcern when you do ſo, by the tip on the top of the firſt or great Part of the Nocturnal;) look through the Hole in the Center for the *North-Star*.

3. Turn that edg of the long Index, which proceedeth from the Center, to the *Guards*; ſeeing at the ſame time the *North-Star* through that Hole: Then will the Index ſhew the Hour of the Night on the ſecond or middle Part.

2. *To find the Bearing of the Guards either of the Little or Great-Bear; that is, upon what Point of the Compaſs they are.*

1. Having obſerved all the particular Directions, as before, in finding the Hour of the Night, you ſee the *North-Star* through the Hole, and the Guards by the edg of the long Index.

The Figure of the
NOCTURNAL.



2. Then look on the back-ſide of the Nocturnal, what Point of the Compaſs ſtandeth againſt the foreſaid edg of the **Index**; which is the Bearing of the *Guards*, and at the ſaid Point of the Compaſs is figured the *North-Star's Declination from the Pole*, at that time, either above or under.

Example 1.

The 20th *of* December, *at* 6 *of the Clock in the Morning, obſerving the Pointers or Guards of the Great-Bear by the edg of the Index; I demand their Bearing, and Declination of the North-Star?*

Right againſt that edg of the Index (you obſerve with), and on the back-ſide of the Nocturnal, is S. W. by S. the Point of the Compaſs required: And on the ſaid Point of the Compaſs is 1 *d.* 10 m. *und.* ſignifying the *North-Star* is then 1 *d.* 10 *m.* under the Pole.

Example 2.

The 14th *of* February, *I obſerve* (*according to the Directions before given*) *at* 7 *a clock in the Evening, the Guards of the Little-Bear by the edg of the long Index; I demand their Bearing, and Declination of the North-Star?*

Seeing the *North-Star* through the Hole in the middle, and the Guards of the Little-Bear by the edg of the long Index, (note that edg reſpecting the Center of the Inſtrument) and the Index cutting 7 of the Clock in the middle part; then on the back-ſide of the Nocturnal, and againſt the ſaid edg of the

Index, is N. E. the Point of their Bearing; and on the ſaid Point is figured 0. 35. *Abo.* which ſignifieth the *North-Star* is then 35 Minutes above the Pole.

3. *To find the Moon's Southing by the* Nocturnal.

To do this, look the Moon's-Age in the outermoſt Circle, on the middle or ſecond piece of the Nocturnal; and right againſt it, in the innermoſt Circle of the ſame Piece, is the Southing.

Example.

If the Moon be 19 Days old; I demand her Southing?

Right againſt 19, in the outermoſt Circle, is 3 $\frac{1}{2}$ in the innermoſt Circle; which is half an Hour paſt 3 of the Clock in the Morning, the time of the Moon's coming to the South.

4. *To find the time of Full-ſea, by the Nocturnal.*

1. Find the Moon's Southing according to her Age, as before directed.

2. Set the ſhort Index of the middle Part, (if it have 2 Indexes, that which ſtands at 12) to the time of Full-ſea on the new, or Full-Moon (for the Place propoſed) in the innermoſt Circle of the great Piece.

3. Keeping that there, bring the long Index to the Southing, or Moon's Age on the middle Piece.

4. Then right againſt the long Index, and in the innermoſt Circle on the great Piece, is the time of Full-ſea required.

Exam-

Example.

The Moon being 19 *Days old*; *I demand the time of Full-ſea at* Graveſend?

1. By the third Uſe find the Moon's Southing, which is 3 ½ Hours in the Morning.

2. Bring the Index or tooth of the middle Part (which ſtands at 12) to 1 ½ Hour, which is (N.N.E. and S.S.W.) the Point of the Compaſs making Full-ſea at *Graveſend* on the New, or Full-Moon, in the innermoſt Circle of 24 Hours on the great Piece. Keeping that faſt there,

3. Turn the long Index to 19 Days, the Moon's Age, or to 3 ½ Hours, the Moon's Southing, on the middle Piece.

4. Then right againſt the long Index, and in the innermoſt Circle on the great Piece, is 5 Hours, the time of Full-ſea, or High-water, in the Morning at *Graveſend.*

5. *To find the Latitude, by the Nocturnal, and Fore-ſtaff.*

1. Find the North-Star's Declination from the Pole by obſerving with the Nocturnal, as directed in Example 1 and 2 of the 2*d* Uſe.

2. Then (at the ſame time) with a Fore-ſtaff take the Altitude of the *North Star.*

3. If the North-Star be above the Pole, ſubtract its Declination from; if under, add it to its Altitude; the Sum, or Difference, is the Latitude required.

Exam-

Example 1.

Suppose the 14th *of* February, *at 7 of the Cloc in the Evening, observing with the* Nocturnal, *fin the Guards of the* Little-Bear *to bear* N. E. *which i* 0 d. 35 m. *above the Pole; and at the same time, b the* Fore-staff, *find the Altitude of the* North-Sta 42 d. 10 m; *I demand the Latitude of the Place?*

	d.	m.	
From the Altitude of the North-Star-	42	10	
Subtract its Declination above ——	0	35	
Remainder is the Latitude required--	41	35	North.

Example 2.

The 20th *of* December, *at 6 of the Clock in th Morning, observing with the* Nocturnal, *I find th Guards or Pointers of the* Great-Bear *S. W. by S which is* 1 d. 10 m. *under the Pole; and at the sam time, by the* Fore-staff, *find the Altitude of th* North-Star 45 d. 22 m; *I demand the Latitude o the Place of Observation?*

	d.	m.	
To the Altitude of the North-Star-	45	22	
Add its Declin. from the Pole under-	1	10	
Sum is the Latitude required ——	46	32	North.

Th

The Deſcription and Uſe OF *Gunter's* SCALE.

THIS Inſtrument, for its quick and eaſy diſpatch of the moſt common and uſeful Proportions, deſerves as generally to be known its Uſes, as by its Name: On that account I'le ach a little on its Deſcription, before I give you a ſle of its manifold Uſes; and all as brief and plain I can.

The Deſcription of Gunter's *Scale.*

Gunter's Scale, (ſo called from Mr. *Gunter* its firſt Contriver) uſually made of Box-wood, a Scale, or Ruler of any Length and Breadth, (but ommonly 2 Feet long, and 1 $\frac{1}{2}$ Inch broad), on hich are the Lines or Scales of Numbers, Sines, angents, *&c.* Of which are 2 ſorts, the *long Gunter* or *ſingle Gunter*, and the *ſliding Gunter*; on oth ſorts are the ſame Lines, though differently ed; the firſt with Compaſſes, the latter by ſliing.

The Lines moſt uſual now ſet on Gunters are and have their Names at the Right-hand end thereof,

thereof, under one another thus; *Sine-Rumb*, *Tang. Rumb*, *Numbers*, *Sines*, *Verſed-Sines*, *Tangents*, *Meridian*, (for Meridional-parts) *and Equal-Parts.*

3. The *Sine-Rumb* and *Tang. Rumb*, are both the Points of the Mariners Compaſs; the firſt is figured from the Left-hand towards the right with 1, 2, 3, 4, 5, 6, 7, and 8, at which is a braſs Center-pin; the latter is figured thus, 1, 2, 3, and 4, at the ſame Center-pin, and thence back again towards the Left hand with 5, 6, and 7; each Point in both Lines where it can, is ſubdivided into Halfs and Quarters theſe 2 Lines are chiefly uſeful in Navigation.

4. The next under *Tang. Rumb*, is the *Line of Numbers* figured thus; near the Left-hand end, begins at 1, and on towards the Right-hand 2, 3, 4, 5, 6, 7, 8, 9; then 1 in the middle, at which is braſs Center-pin; going ſtill on 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the end, where is another Center-pin. This Line is of the moſt general Uſe, and requires the larger account of it: wherefore take theſe following Notes for the *Line of Numbers.*

Note 1. *All the Figures on this Line may be taken ſingle as they ſtand; or be increaſed, or diminiſhed at pleaſure, ſo it be in decuple Proportion:* That is, the firſt 1 may be counted for 1, or 10, or 100, or 1000, *&c.* then the next 2 is accordingly 2, or 20, or 200, or 2000, *&c.* Again, the firſt 1 may be reckoned 1 tenth, or 1 hundredth, or 1 thouſandth Part, *&c.* then the next 2 is 2 tenths, or 2 hundredths, or 2 thouſands Parts, *&c.* So that,

If the firſt 1 be taken for 1, the middle 1 is then 10, and 2 to its Right-hand is 20, 3 is 30, 4 is 40, and 10 at the end is now 100: Again, if the firſt 1 be counted 10, the next 2 is 20, 3 is 30, and ſo on making the middle 1 now 100, the next 2 is 200, and is 300, 4 is 400, and 10 at the end is now 1000.

In like manner, if the firſt 1 be eſteemed for 1 tenth, the next 2 is 2 tenths, and the middle 1 is 1, and next 2 is 2, and 10 at the end is now 10: Again, if the firſt 1 be counted for 1 hundred Part, the next is 2 hundredth Part, the middle 1 is now 10 hundredth Parts or 1 tenth part, and next 2 is 2 tenth parts, and 10 at the end is now but 1 whole Number or Integer.

Note 2. *As the Figures are increaſed, or diminiſhed in their Value, ſo in like manner muſt all the intermediate Stroaks or Subdiviſions, be increaſed, or decreaſed:* That is, if the firſt 1 (at the Left-hand) be counted 1, then 2 (on the Right-hand of it) is 2, and each Subdiviſion between them is now 1 tenth Part; and ſo all the way to the middle 1, which now is 10, the 2 next it, is 20; now the longer Stroaks between 1 and 2, are to be counted from 1 thus, 11, 12, (where is a braſs Pin) then 13, 14, 15, (ſomething a longer Stroak than the reſt) then 16, 17, 18, 19, and 20, at the Figure 2: And all the ſhorter Stroaks between theſe longer, are now each to be counted for a tenth Part, from the middle 1 to the next 2 now 20; from whence the longer Diviſions, between the Figures, are Units; thus, 21, 22,

23,

23, *&c.* to 3 which is 30; and the ſhorter Diviſion between them, each now is ½ or 2 tenths of an *Integer*; and ſo is it till you come to 4, which now is 40; from whence each ſhort Stroak or little Diviſion is ½ or 5 tenths of a *Unit*.

Again if 1 at the left-end be 10, the *Figures* between it and the middle 1, are common Tens, and the Subdiviſions (between each Figure) are *Units*; and from the middle 1 to 10 at the end, each *Figure* is ſo many *Hundreds*; and between theſe *Figures*, each longer Diviſion, are *Tens*; and from the middle 1 to 2, each leſſer Diviſion, is a Unit; from 2 to 4, each leſſer Stroak, is 2 *Units*; from the Figure 4 to the end, each ſhorter Stroak, is 5 *Units*.

Note 3. *On the* Line of Numbers, *may be counted a Number of any Denomination*: whether Meaſures as Inches, Feet, Yards, Miles, Leagues, *&c.* Weight; as Hundreds, Pounds, Ounces, *&c.* Money; as Pounds, Shillings, *&c.* or Time; as Years, Months, Days, Hours, *&c.* provided always the *Integer* be divided or ſuppoſed to be divided *Decimally*.

I have inlarged beyond my firſt Intention, in the Deſcription of this Line; I'le endeavour brevity in what remains.

5. Next under *Numbers* is the Line of *Sines*, beginning at the Left-hand at 25 Minutes, and figured thus; 1, 2, 3, *&c.* to 10; then 20, 30, 40, *&c.* to 90, ending at the Right-hand, where is a brass Center

Center-pin; theſe Figures never change their Value or Denomination, being here (and in all the other Lines under it) *Degrees.*

From the beginning of this Line to 10 Degrees, each *Degree* is divided into 12 Parts, by greater and leſſer Stroaks, making each 5 *Minutes*; from 10 *Degrees* to 20, each ſmaller Stroak is 10 *Minutes*; from 20 to 30, each is 15 *m.* from thence to 60, they are 20, but the moſt are 30 *m.* each leſſer Subdiviſion; and from 60 to 80, each Diviſion is a Degree; 80 and 90 are ſo near together, that it admits but one Stroak between, which is for 85 *Degrees.*

6. Next to, and a butting on the Line of *Sines*, is the *Verſed-Sines*, beginning at the Right-hand (againſt 90 in the *Sines*), and from thence figured towards the Left-hand; thus, 10, 20, 30, 40, *&c.* ending at the left-end at about 169 *Degrees*: the Subdiviſions are thus, from 10 to 30, each is 2 *Degrees*; from thence to 90, it's ſingle *Degrees*; from thence to 120, it's $\frac{1}{2}$ *Degrees*; and from thence to the end it's divided into $\frac{1}{4}$ s. or each 15 *Minutes.*

7. Under *Verſed-Sines*, is the *Line of Tangents*, beginning at the left-end, as the *Sines* do; from thence figured to the Right-hand thus, 1, 2, 3, *&c.* to 10; and ſo on, 20, 30, 40, and 45 at the Right-hand, where is a little braſs Center-pin, juſt under and even with that in the *Sines*; from thence back again, it's figured 50, 60, 70, 80, *&c.* to 89, ending at the left-end, where it began at 1 Degree: The Subdiviſions of this Line, are (for the moſt) like thoſe of the *Sines*; ſo paſſing that, I proceed,

8. Next

8. Next to the *Tangents*, and under it, is the *Line of Meridional Parts*, beginning at the Right-hand is figured thus, 10, 20, 30, *&c.* to the Left-hand, where it ends at 86 Degrees: This Line, with the Line of Equal-parts under it, are uſed together, and only in that part of Navigation, called *Mercator's-Sailing*: the uppermoſt Line contains the Degrees of the Meridian, or Latitude, in a Mercatory-Chart; and the lower, as the Equinoctial, the Degrees of Longitude.

9. Theſe 8 Lines now deſcribed, are ſet on the *Sliding-Gunter*, but not in the ſame order, being ſome on one ſide, and ſome on t'other; alſo the Lines of Numbers, Sines and Tangents, are ſet double, that is, one on each ſide, as the middle-piece ſlides: Which middle-piece is ſo contrived, to ſlip to and fro eaſily, to ſlide out, and to be put in any ſide uppermoſt, in order to bring thoſe Lines together (or againſt one another) moſt proper for ſolving the Queſtion, wrought by the *Sliding-Gunter*: Of which, let this ſhort *Deſcription* ſuffice; the following *Uſes* will ſupply what's here wanting, being in a manner *Deſcriptions*.

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1. *The Uſe of* Gunter's *Scale, both ſingle and ſliding.*

IN order to a right underſtanding of the Uſes of this Scale, it's neceſſary to number well of them; that is to find readily a Place repreſenting an

any given Number, and that chiefly on the Line of Numbers; which is as follows.

PROB. I.

To find a whole Number on the Line of Numbers.

The Rule.

1. LOOK the firſt Figure of the given Number among the figured Diviſions.

2. For the ſecond Figure, count ſo many Tenths (or of the longer Stroaks) from the figured Diviſion, towards the Right-hand, as are Units in the ſaid ſecond Figure.

3. Then for the third Figure, count from the laſt Tenth (repreſenting the ſecond Figure) ſo many leſſer Stroaks or Centeſms) as that Figure hath Units.

4. In like manner for the fourth Figure, count from the laſt Centeſm, ſo many thouſands (or leſſer Stroaks) as are *Units* in it; and ſo on for more Figures, though four Figures or Thouſands are as many as well can be diſcerned on a two-foot Gunter.

5. This done, the laſt place is the Point where the propounded Number is repreſented.

Example 1.

To find the Point in the Line of Numbers that doth repreſent 2.

According to the Rule above, I take the Diviſion at the figure 1 (in the middle of the Line of Num-

bers) for the firſt Figure of 12, the propounded Number; then for 2, the ſecond Figure, I count two Tenths (or longer Stroaks) to the Right-hand from the ſaid Stroak at 1; and this laſt is the Point repreſenting 12, where (moſt commonly) is a ſmall braſs Center-pin, being often in uſe.

Example 2.

Suppoſe the Point repreſenting 22 *on the Line of Numbers, were required to be found.*

The firſt Figure in the Number 22 being 2, I take the Diviſion at the Figure 2 for it; and for the ſecond Figure being 2, I count 2 Tenths onwards; and that is the Point repreſenting 22, at which (in ſome Gunters) is a braſs Center-pin.

Example 3.

I deſire to know the Point on the Line of Numbers, that doth repreſent 144.

The firſt Figure being 1, I take the Diviſion at the middle 1 for it; the ſecond Figure being 4, I count 4 tenths onwards; and from thence count 4 Centiſms further for the third and laſt Figure; this laſt place is the Point repreſenting 144.

Example 4.

Let it be required to find on the Line of Numbers, the Point repreſenting 1728.

For the firſt Figure 1, take the middle 1; for the ſecond figure 7, count (as before) onward 7 tenths, and that is 700; then for 2, the third figure, count 2 Centeſms from the laſt, and it repreſents 20: laſtly, for the fourth figure 8, eſtimate 8 thouſand

Parts

Parts from the laſt: This Point laſt found, repreſenteth 1728.

PROB. II.

To find a Fraction, or broken Number, on the Line of Numbers.

THE Fractions to be found on this Line, ought always to be Decimal; as theſe, 1, 01, 001; 2, 02, 003, *&c.* that is, $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$; $\frac{2}{10}$, $\frac{2}{100}$, $\frac{3}{1000}$, *&c.* either of Inches, Feet, Yards, Miles, or the like; alſo in Weight, or Time, or any other Denomination whatſoever.

So that all other Fractions muſt be reduced into Decimals, before they can be found on the Line of Numbers; and being ſo reduced, they are expreſſed and found upon this Line, as whole Numbers, by the Rule in *Prob.* I. and needs no Examples.

PROB. III.

To perform Multiplication by the Line of Numbers.

The Rule is;

AS 1 is to the Multiplicand, ſo is the Multiplier 1 to the Product.

Now to work this or any Proportion on the Gunter; this is,

A general Rule:

1. Extend the Compaſſes from the firſt Term to the ſecond.

2. That Extent (in the Compaſſes) laid the

ſame way from the third Term, will reach to the fourth Term, or Thing required.

By the ſliding Gunter, thus;

1. Set the firſt Term (counted on the ſliding or middle piece) right againſt the ſecond Term, counted on the fixed piece.

2. Then ſeek the third Term (always on the ſame the firſt Term was counted) on the ſliding part; and againſt it, on the fixed part, is the fourth Term or Thing required.

Example 1.

What is the Product of 8 *multiplied by* 4?

The Analogy, or Proportion, is this;
As 1 is to 8, ſo is 4 to the Product.
Or it is,
As 1 is to 4, ſo is 8 to the Product.

1. *By the Gunter with Compaſſes.*

Extend the Compaſſes from 1 to 8; that Extent ſet from 4 (the ſame way), reacheth to 32 the Product of 8 multiplied by 4.

Or, the Extent from 1 to 4, being laid from 8, reacheth to 32, the Product, as before.

2. *By the ſliding Gunter.*

Set 1 (at the beginning on the middle or ſliding piece) right againſt 8 (on the fixed or out-ſide piece); then againſt 4 (on the firſt) is 32, (on the ſecond) the Product required.

Or,

Or, ſet 1 (as before) againſt 4, then againſt 8 (on the firſt) is 32 (on the ſecond), the Product, as before.

Example 2.

What is the Product of 16 multiplied by 5?

The Proportion to work it by, is this,
As 1 is to 5, ſo is 16 to the Product.

By Gunter with Compaſſes, thus;

The Extent from 1 to 5 reacheth from 16 to 80, the Product required.

By ſliding Gunter, thus;

Set 1 (on the middle piece) againſt 5 (on the out-ſide piece); then againſt 16 (on the firſt) is 80 (on the ſecond) the Product required.

PROB. IV.

To perform Diviſion by the Line of Numbers.

The Rule or Proportion, is this;

AS the Diviſor is to 1, ſo is the Dividend to the Quotient.

Example 1.

If the Dividend be 64, and the Diviſor 4; what is the Quotient?

To do this, the Proportion is;
As 4 is to 1, ſo is 64 to the Quotient.

By Gunter with Compaſſes, thus;

The Extent from 4 to 1, laid (the ſame way) from 64, reacheth to 16, the Quotient required.

By ſliding Gunter, thus;

Set 4 (on the middle piece) againſt 1 (on the outſide piece); then againſt 64 (on the firſt) is 16 (on the ſecond), which is the Quotient required.

Example 2.

How often is 144 *contained in* 1728?

To do this, the Proportion is this;

As 144 is to 1, ſo is 1728 to the Anſwer.

By Gunter with Compaſſes, thus;

The Extent from 144 to 1, reacheth from 1728 to 12, the Quotient or Anſwer required.

By ſliding Gunter, thus;

Set 144 (on the middle piece) againſt 1 (on the outſide piece); then againſt 1728 (on the firſt) is 12 (on the ſecond), which is the Quotient required.

PROB. V.

To reduce a vulgar Fraction to a Decimal, by the Line of Numbers.

To perform this, the Proportion is thus;

AS the Denominator of the given Fraction is to its Numerator, ſo is 1 to the Decimal-Fraction required.

Example.

Suppoſe it be required to reduce $\frac{3}{4}$ *(a Vulgar-Fraction) into a Decimal Fraction?*

Note;

Note; A Decimal-Fraction hath for its Denominator a 1, with as many Cyphers as its Numerator hath places: And the Proportion to find its Numerator, is thus;

As 4 is to 3, ſo is 1 to the Numerator of the Decimal-Fraction required.

1. *By Gunter with Compaſſes, thus*;

The Extent from 4 to 3, reacheth (the ſame way) from 1 to 75, or $\frac{75}{100}$, the Decimal-Fraction required.

2. *By ſliding Gunter, thus*;

Set 4 (on the middle piece) againſt 3 (on the outſide piece); then againſt 1 (on the firſt) is 75, or $\frac{75}{100}$, the Decimal-Fraction required to be found: So that 75 or $\frac{75}{100}$ is equal in value to $\frac{3}{4}$.

PROB. VI.

Of Continual Proportion, or Geometrical Progreſſion; which is unto two given Numbers: To find a 3d, 4th, 5th, *&c. Number in a continued Proportion, by the Line of Numbers.*

The Analogy by which it is effected, is this;

AS the firſt Number given is to the ſecond; ſo is the ſecond to a third; and ſo is that third to a fourth; and ſo is that fourth to a fifth, *&c.*

Example.

Let the two Numberr given be 2 *and* 4; *unto which it's required to find a* 3d, *a* 4th *proportional*, &c.

For the performance hereof, the Rule is thus;

As 2 is to 4, ſo is 4 to a 3*d*; ſo is that 3*d* to a 4*th*, *&c.*

By Gunter with Compaſſes, thus;

The Extent from 2 to 4, reaches from 4 to 8, the 3*d*; and from 8 to 16, the 4*th*; and from 16 to 32, the 5*th* proportional Number; and ſo on to as many as you pleaſe: So that 2, 4, 8, 16, 32, *&c.* are Numbers in continued Proportion Geometrical, as was required.

By ſliding Gunter, thus;

Set 2 (on the middle piece) to 4 (on the next ſide piece); then againſt 4 (on the firſt) is 8 (on the ſecond) for the 3*d* Proportional; and againſt 8 (on the firſt) is 16 (on the ſecond), the 4*th* Proportional; and in like manner again, 16 is 32 the 5*th* Proportional, as required.

PROB. VII.

Of the Rule of 3 direct, or 3 Numbers given; to find a 4th in Direct-Proportion, by the Line of Numbers.

The Analogy whereby this is performed, is thus;

AS the firſt Number is to the ſecond, ſo is the third to the fourth Number required.

Example 1.

If the Diameter of a Circle be 7 Inches, and the Circumference thereof 22; What is the Circumference of a Circle, whoſe Diameter is 14 Inches?

To

To perform this, the Analogy is thus;

As 7 is to 22, ſo is 14 to the Circumference required.

By Gunter with Compaſſes.

The Extent from 7 to 22, laid (the ſame way) from 14, will reach to 44, the Circumference of the Circle, whoſe Diameter is 14; which was required.

By ſliding Gunter, thus;

Set 7 (on the middle piece) againſt 22 (on the outſide piece), then againſt 14 (on the firſt) is 22 (on the ſecond), which is the Circumference required.

Example 2.

If the Circumference of a Circle be 3.14, *and its Diameter* 1; *What will the Diameter of another Circle be, whoſe Circumference is* 44?

The Proportion is;

As 3.14 is to 1, ſo is 44 to the Diameter required.

By Gunter with Compaſſes, thus;

The Extent from 3.14 to 1, reacheth from 44 to 14, the Diameter required.

By ſliding Gunter, thus;

Bring 3.14 (on the middle piece) right againſt 1 (on the outſide piece); and then againſt 44 (on the firſt) is 14 (on the ſecond), which is the Diameter requird.

Note; In the Rule of three Direct; If the 3*d* Num-

Number be greater than the 1*ſt*, then will the 4*th* Number be greater than the 2*d*: But,
If the 3*d* Number be leſs than the 1*ſt*, then the 4*th* will be leſs than the 2*d*.

Example 3.

If 30 *Acres of Land be worth* 25 *Pound a Year; how much a Year will* 54 *Acres be worth?*

To do this or any Queſtion in the *Rule of Three*, always in the Proportion, let the firſt and third Numbers or Terms be of one Kind or Denomination: And in this it is,

As 30 Acres is to 25 Pound, ſo is 54 Acres to 45 Pounds.

For by Gunter with Compaſſes;

The Extent from 30 to 25, reacheth from 54 to 45, the yearly Rent required.

Alſo, by ſliding Gunter.

Bring 30 againſt 25, then againſt 54 (on the firſt) is 45 (on the ſecond), as before.

By this time the Reader is ſo well acquainted in the way of working a Proportion on the Line of Numbers, with Compaſſes, or without, that it's a needleſs thing to expreſs it in words, being ever the ſame: Henceforward you ſhall have only the Proportion ſet down, leaving the manner of its Operation to your Practice, except in caſe where the Working differs from what went before.

PROB.

PROB. VIII.

f the Rule of Proportion Inverſe, or three Numbers given; to find a fourth in an Inverſe Proportion (or in the backward Rule of 3) by the Line of Numbers.

IN this Rule you muſt note; If the 3*d* Number be greater than the 1*ſt*, then will the 4*th* be leſs an the 2*d*: But,

2. If the 3*d* be leſs than the firſt, the 4*th* is to be ater than the 2*d*.

3. And to reſolve Queſtions of the backward Rule 3, the Proportion is thus;

As the third Number is to the ſecond, ſo is the firſt to fourth.

Example.

If 72 Pioneers make a Trench in 48 Hours; in how g time can 54 Pioneers make it?

By the Directions above, this is the Proportion;

As 54 Men is to 48 Hours, ſo is 72 Men to 64 urs; the Anſwer to the Queſtion: From whence u may conclude, that 54 Men will perform as much 64 Hours, as 72 Men in 48 Hours.

PROB. IX.

f Duplicate Proportion, or 3 Numbers given; to find a 4th *in a Duplicate Proportion, by the Line of Numbers.*

THIS Rule is chiefly uſed in Proportions of Lines to Superficies, *&c.* Wherein the firſt and ſecond m are to be of one Kind or Denomination.

Exam-

Example 1.

If the Diameter of a Circle be 1, *and its Area o* *Content* 0.78539; *What's the Content of a Circle whoſe Diameter is* 14?

To perform this, the firſt and ſecond Terms (by th Note above) are to be Lines; that is, the Diamete given; and then the Proportion is thus:

As 1 is to 14, ſo is 0.785 to a 4*th*; and ſo is tha 4*th* to the Content required.

By Gunter with Compaſſes.

The Extent from 1 to 14, reacheth from 0.785 11; and the ſame Extent laid (the ſame way) from 1 reacheth to 154, the Content required.

By the ſliding Gunter.

Bring 1 (on the middle piece) right againſt 14 (the outſide piece); then againſt 0.785 (on the firſt) 11 (on the ſecond); and againſt 11 (on the firſt) is 1 (on the ſecond), the Content required.

Example 2.

If the Diameter of a Circle be 7, *and its Ar* 38.5; *What is the Area of a Circle whoſe Diameter* 12? Anſwer, 112.

For, as 7 is to 12, ſo is 38.5 to 66; and ſo is to 112.

Example 3.

If the Diameter of a Circle be 1, *and its Ar* 0.78539; *What is the Diameter of a Circle, whoſe Area is* 154? Anſwer, 14.

In this the Proportion is of Superficies to Line which is thus;

As Area 0.785 is to Area 154; ſo is ſquare of Diameter 1, to ſquare of Diameter required.

By Gunter with Compaſſes.

The Extent from 0.785 to 154, reacheth from 1 to 196, the ſquare of the Diameter required.

Then divide the ſpace between 1 (always the middle 1, if the number of places be odd; but if even, the firſt 1) and 196, into two equal parts, the foot of the middle reſteth at 14, the Diameter of the Circle, whoſe Area is 154.

By the ſliding Gunter.

Bring 0.785 againſt 154, and againſt 1 (on the firſt) is 196 (on the ſecond); then find the middle between 1 and 196, which is at 14, the Diameter as before.

Example 4.

The Diameter of a Circle being 1, *and its Area* 0.785; *What is the Diameter of a Circle, whoſe Area is* 212? Anſwer, 12.

For, as 0.785 is to 112, ſo is 1 to 144; the middle between it and 1, is at 12, the Diameter required.

PROB. X.

Of Triplicate Proportion, or 3 *Numbers given; to find a* 4th *in a Triplicate Proportion, by the Line of Numbers.*

THIS Problem concerneth the Proportion of Lines to Solids, and the contrary; in which, ever more make the firſt and ſecond Term to be of one Denomination.

Exam-

Example 1.

If an Iron Bullet weigh 9 Pounds, and its Diame-ter is 4 Inches; What is the Weight of another Iron Bullet, whose Diameter is 6 Inches?

To perform this, the first and second Terms are be Lines; that is, the given Diameters, and then t Proportion is thus;

As 4 is to 6, so is 9 to 13.5; and so is 13.5 20.2, so is 20.2 to 30.3; that is, 30 Pounds 3 Tent of a Pound which is the Weight required.

Example 2.

If an Iron Bullet 1 Inch Diameter weigh Pou 0.1406 Parts; What is the Weight of another, whe Diameter is 4 Inches, it being of the same Meta Answer, 9 Pounds. For,

As 1 is to 4, so is 0.1406 to 0.563; and so 0.563, to 2.25; and so is 2.25 to 9 Pounds, t Weight required.

Example 3.

If a Gun 6 Inches bore require 11 Pound of Pow der; How much will serve a Gun 4 Inches bore Answer, Pounds 3.25 Parts. For,

As 6 to 4, so is 11 to 7.3; and so is 7.3, to 4.88 and so is 4.88 to 3.25; which is Pounds 3.25 Par of a Pound, or Pounds $3\frac{1}{4}$.

Example 4.

If an Iron Bullet 1 Inch Diameter weigh Pounc 0.1406 Parts; What Diameter shall that be whic weigheth 9 Pound of the same Metal? Answer, Inches. For,

A

As 0.1406 is to 9, ſo is 1 to 64, the Cube of the Diameter required; then divide the ſpace between 1 and 64 into 3 equal parts, and the foot in the firſt $\frac{1}{3}$ part (from 1) reacheth to 4, the Diameter of the Iron Shot weighing 9 Pounds.

I. *The Uſe of the Line of Numbers (commonly called* Gunter's *Line) in meaſuring Superficies, as Board, Glaſs, Land, &c. and Solids, as Timber, Stone, Gauging, &c.*

PROB. I.

The Length and Breadth of any Square, or long-ſquare Superficies given; to find the Area or Content thereof.

The Proportion is this;

AS 1 to the Breadth, ſo is the Length to the Content.

Example 1.

A plain Superficies, as a Board or Plank, be given to be meaſured; the Breadth thereof is 15 *Inches, and its Length* 61 *Inches: What is the Content of it? Anſwer,* 915 *Inches.* For,

As 1 to 15, ſo is 61 to 915 Inches; the Content required.

Note; Such as the Breadth and Length is, ſuch is the Content; ſo that if the Breadth and Length be Feet, the Content is Feet; if Perches, then Perches, *&c.*

Exam-

Example 2.

A Piece of Wainſcot in form of a Long-ſquare, whoſe length is Feet 15.5 *Parts, and breadth Feet* 2.25 *Parts: What is the Content?* Anſwer, *Feet* 34.86 *Parts.* For,

As 1 is to 2.25, ſo is 15.5 to 34.86, the Content required.

PROB. II.

The Breadth and Length of a Superficies given in kind of Meaſure; to find the Content thereof in another kind of Meaſure.

To do this, the Proportion is thus;

AS the other kind of Meaſure is to the Breadth ſo is the Length to the Content.

Example 1.

A Plank or Board 15 *Inches broad,* 61 *Inches long; I demand the Content of it in Feet?* Anſwer, *Feet* 6.35 *Parts.*

In a Foot-ſuperficial, or a Square-foot, is 144 ſquare Inches, and therefore the Proportion is thus;

As 144 is to 15 Inches, ſo is 61 Inches to Feet 6.35 Parts of a Foot.

Example 2.

A Piece of Land, in form a long Square, whoſe Breadth being 30 *Perches, Length* 183 *Perches; What is the Content in Acres?* Anſwer, *Acres* 34.35 *Parts.*

For 160 Perches is in an Acre, and the Proportion is thus;

As 160 is to 30 Perches, ſo is 183 Perches to Acres 34.35 parts of an Acre.

Exam

Example 3.

A Piece of Painting, in form a long Square, whoſe breadth, Feet 3.5, and Length 21 Feet; How many ſquare Yards is the Content? *Anſwer*, Yards 8.16 Parts.

For 9 Feet being a Yard ſquare, the Proportion is thus;

As 9 is to 3.5 Feet, ſo is 21 Feet to Yards 8.16 Parts.

PROB. III.

The Breadth of a Superficies given in one kind of Meaſure, and the Length in another; to find the Content in the greater Meaſure.

To do this, the Proportion is thus;

AS the greater Meaſure is to the Breadth, ſo is the Length to the Content required.

Example 1.

Admit a Board 10 Inches broad, and 20 Feet long; I demand the Content in Feet? *Anſwer*, Feet 16.6 tenths of a Foot.

For the Proportion is thus;

As 12 is to 10 Inches, ſo is 20 Feet to Feet 16.6 tenths.

Example 2.

If a board or Plank be 15 Inches broad, and 27 Feet long; What is the content of it in Feet? *Anſwer*, Feet 33.75 parts of a Foot, or 33 ¾ Feet. For it is,

As 12 is to 15 Inches, ſo is 27 Feet to Feet 33.75 parts.

Example 3.

A Board 7 ½ Inches broad, and 29 ¼ Feet long; What's the Content in Feet? *Anſwer*, Feet 18.4 tenths. For it is,

As 12 is to 7.5, ſo is 29.25 to Feet 18.4 tenths.

Example 4.

A Plot of Land (in form a long Square) whoſe Breadth is 30 Perches, and Length is Chains 15.25 Links, (meaſured by a Chain of 4 Perches in 100 Links); I demand the Content thereof in Acres? *Anſwer*, Acres 11.4 tenths. For it is,

As 4 is to 30 Perches, ſo is Chains 15.25 to Acres 11.4 tenths of an Acre.

PROB. IV.

The Breadth of a Superficies given; to find how much in Length will make a Foot, a Yard, a Perch, or an Acre, &c.

To do this take this general Rule:

AS the Breadth is to a Foot, (a Yard, *&c.*) ſo is a Foot, (a Yard, *&c.*) to the Length, which will make a Foot, a Yard, *&c.*

Example 1.

If a Board be 7 ½ Inches broad; How much in Length will make a Foot-ſquare? *Anſwer*; Inches 19.2 tenths of an Inch.

For the Proportion is thus;

As 7.5 is to 12, ſo is 12 to Inches 19.2 tenths.

Example 2.

A Plank 30 Inches broad; How much in lengt
wil

will make a Foot? *Anſwer*, Inches 4.8 tenths of an Inch. For it is,

As 30 Inches is to 12, ſo is 12 to Inches 4.8 tenths.

Example 3.

A Pain of Glaſs being in breadth Feet 2.5 tenths; How much in length will make a Foot? *Anſwer*, 4 tenths of a Foot. For it is thus,

As 2.5 is to 1 Foot, ſo is 1 Foot to 0.4 tenths of a Foot.

Example 4.

A Piece of Matting being 27 Inches broad; How much in length will make a Yard ſquare? *Anſwer*, 48 Inches or 4 Feet. For it is thus,

As 27 Inches is to 36 Inches, ſo is 36 Inches to 48 Inches. But if the Breadth be given in Feet; that is, for 27 Inches, it is 2 $\frac{1}{4}$ Feet, or 2.25 Feet: Then it is thus;

As 2.5 is to 3 Feet, ſo is 3 Feet to 4 Feet in length to make a Yard-ſquare.

PROB. V.

The Diameter of a Circle given; to find the Circumference.

The Analogy or Proportion is thus;

AS 1 is to 3.142, ſo is the Diameter to its Circumference.

Example.

If the Diameter of a Circle be 15 Inches; What is the Circumference of it? *Anſwer*, Inches 47.12 Parts. For,

As 1 is to 3.142, ſo is 15 Inches to Inches 47.12 Parts.

PROB. VI.

The Circumference of a Circle given; to find its Diameter.

The Proportion ſtands thus;

AS 3.142 is to 1, ſo is the Circumference to its Diameter.

Example.

The Circumference of a Circle being 44 Feet; What is the Diameter thereof? *Anſwer*, Feet 14. For it is,

As 3.142 is to 1, ſo is 44 Feet to Feet 14.

PROB. VII.

The Diameter of a Circle given; to find its ſuperficial Content.

The Analogy is thus;

AS 1 is to the Diameter, ſo is 0.7854 to a 4*th* Number; and ſo is that 4*th* to the Superficial Content required.

Example.

The Diameter of a Circle being 15 Inches; What is the Content of it? *Anſwer*, Inches 176.7 tenths.

For it is,

As 1 is to 15, ſo is 0.7854 to 11.78; and ſo is 11.78 to 176.7. the ſuperficial Content required.

PROB.

PROB. VIII.

The Circumference of a Circle being given, to find the ſuperficial Content of it.

The Proportion is this;

AS 1 is to the Circumference, ſo is 0.07958 to a *4th*; and ſo is that *4th* to the Superficial Content required.

Example.

If the Circumference of a Circle be 44 Inches; What's the Content? *Anſwer*, Inches 154.06 Parts of an Inch. For it is,

As 1 is to 44, ſo is 0.07958 to 3.5; and ſo is 3.5 to 154.06.

III. *The Uſe of the Line of Numbers in ſolid Meaſure, ſuch as Timber, Stone, Gauging,* &c.

PROB. I.

The ſide of a ſquare Solid given in Inches, to find how much in Length will make a Foot-ſolid.

The Proportion is thus;

AS the given ſide is to 12, ſo is 12 to a *4th* Number; and ſo is that *4th* Number to the Length required to make a Foot-ſolid.

Example 1.

A ſquare Piece of Timber or Stone, whoſe Breadth and Depth, each 8 Inches; How much in Length will

make a Foot-ſolid? *Anſwer*, 27 Inches, or 2 Feet 3 Inches. For it is,

As 8 is to 12, ſo is 12 to 18; and ſo is 18 to 27 Inches.

Example 2.

A ſquare Piece of Timber or Stone, whoſe ſide is 2 Feet or 24 Inches; How much in Length will make a Foot? *Anſwer*, 3 Inches. For it is,

As 24 is to 12, ſo is 12 to 6; and ſo is 6 to 3 Inches.

PROB. II.

The Side of a ſquare Solid given in Foot-meaſure, (which is the Decimal Foot, or a Foot divided into 100 equal Parts); to find how much in Length will make a Foot-ſolid.

The Proportion is thus;

AS the given Side is to 1, ſo is 1 to a *4th* Number; and ſo is that *4th* Number to the Length required to make a Foot-ſolid.

Example.

A ſquare Piece of Timber, whoſe ſide is Foot 1.52 Parts; How much in Length will make a Foot-ſolid? *Anſwer*, 0.438 Parts of a Foot. For it is,

As 1.52 is to 1, ſo is 1 to 0.664; and ſo is 0.664 to 0.438 Parts of a Foot.

PROB.

PROB. III.

The Breadth and Depth of a Solid, whoſe two Ends are equal Long-Squares, being given in Inches, or Foot-meaſure; to find how much in Length will make a Foot-ſolid.

1. *The Proportion for Inches is thus;*

AS 12 is to the Breadth, ſo is the Depth to a 4*th* Number: Then,

As that 4*th* Number is to 12, ſo is 12 to the Length in Inches to make a Foot-ſolid.

2. *The Proportion for Foot-Meaſure is thus;*

As 1 is to the Breadth, ſo is the Depth to a 4*th* Number: Then,

As that 4*th* Number is to 1, ſo is 1 to the Length in Foot-meaſure to make a Foot-ſolid.

Example 1.

A Piece of Timber or Stone, whoſe Breadth is 11 Inches, and Depth 19 Inches; How much in Length will make a Foot? *Anſwer*, Inches 8.26 Parts. For it is,

As 12 is to 11, ſo is 19 to 17.5. And then ſay,

As 17.5 is to 12, ſo is 12 to Inches 8.26 Parts in Length to make a Foot-ſolid.

Example 2.

A Piece of Timber, in Breadth Foot 0.75 Parts, and Depth Foot 1.25 Parts; How much in Length will make a Foot-ſolid? *Anſwer*, Foot 1.06 Parts. For it is,

As 1 is to 0.75, ſo is 1.25 to 0.94: Then ſay,

As 0.94 is to 1, ſo is 1 to Foot 1.06 Parts in length to make a Foot.

PROB. IV.

The ſide of a ſquare Solid, and its Length being given; to find the Content.

1. WHen the Side is given in Inches, and Length in Feet, the Proportion is thus;

As 12 is to the given Side, ſo is the Length to a *4th* Number; and ſo is that *4th* Number to the Content in Feet.

2. When the Side and Length are both given in Foot-meaſure, the Proportion is thus;

As 1 is to the given Side, ſo is the Length to a *4th* Number; and ſo is that *4th* Number to the Content required.

Example 1.

A ſquare Piece of Timber, whoſe Side is 9 Inches, and Length 35 Feet; How many Feet of Timber is in it? *Anſwer*, Feet 19.85 Parts. For it is,

As 12 is to 9, ſo is 35 to 26.4; and ſo is 26.4 to Feet 19.85 Parts.

Example 2.

A Piece of Timber 16 Inches ſquare, and 28 feet long; How much is the Content? *Anſwer*, 50 feet. For it is,

As 12 to 16, ſo is 28 to 37.4; and ſo is 37.4 to 50 Feet.

Example 3.

A Stone, feet 2.75 parts ſquare, and feet 7.50 parts long; How much is the Content? *Anſwer*, feet 36.52 parts. For it is,

As 1 to 2.75, ſo is 7.50 to 20.6; and ſo is 20.6 to feet 36.52 parts.

PROB.

PROB. V.

The Length, Breadth, and Depth of a ſquare Solid being given, to find the Solid Content.

1. IF the Breadth and Depth be given in Inches, and the Length in Feet, the Proportion is thus;

As 12 is to the Breadth, ſo is the Depth to a *4th* Number: Then ſay,

As 12 is to that *4th* Number, ſo is the length in feet to the Content in feet.

2. When the Length, Breadth, and Depth are all given in Foot-meaſure, then the Proportion is thus;

As 1 is to the Breadth, ſo is the Depth to a *4th* Number: and then again ſay,

As 1 is to that *4th* Number, ſo is the Length to the Content in Feet.

Example 1.

If a ſquare Piece of Timber be in Breadth 19 Inches, Depth 11 Inches, and 20 Feet long; How much is the Solid Content? *Anſwer*, feet 16.75 parts. For it is thus;

As 12 to 19, ſo is 11 to 17.5: Then ſay,

As 12 to 17.5, ſo is 20 to feet 16.75 parts, the Content required.

Example 2.

A Stone 20 Inches broad, 13 Inches deep, and Feet 15.25 or 15 $\frac{1}{4}$ Feet; How much is the Content? *Anſwer*, feet 27.5 or 27 $\frac{1}{2}$ feet. For it is,

As 12 to 20, ſo is 13 to 21.67: And then,

As 12 to 21.67, ſo is 15.25 to 27.5, that is 27 $\frac{1}{2}$ feet.

Exam-

Example 3.

A ſquar'd Piece of Timber, foot 1.25 broad, foot 0.56 deep, and 36 feet long; How much is the Content? *Anſwer*, feet 25.20 parts, or 25 $\frac{2}{10}$ feet. For it is,

As 1 is to 1.25, ſo is 0.56 to 0.70: And then,
As 1 is to 0.70, ſo is 36 to feet 25.2 tenths.

PROB. VI.

The Diameter of a Cylinder given, to find how much in length will make a Foot-ſolid.

1. IF the Diameter be given in Inches, the Proportion is thus;

As the given Diameter is to 13.531, ſo is 12 to a *4th* Number; and ſo is that *4th* Number to the length required to make a Foot-ſolid.

2. When the Diameter is given in foot-meaſure, the Proportion is thus;

As the given Diameter is to 1.128, ſo is 1 to a *4th* Number; and ſo is that *4th* Number to the length which will make a Foot-ſolid.

Example.

A round Piece of Timber or Stone, being 15 Inches in Diameter; How much in length will make a Foot-ſolid? *Anſwer*, Inches 9.78 parts of an Inch. For it is,

As 15 is to 13.531, ſo is 12 to 10.75; and ſo is 10.75 to Inches 9.78 Parts.

But ſuppoſing the Diameter of the ſame to be taken in foot-meaſure, then it's foot 1.25 parts; Now how

w much will make a ſoot? *Anſwer*, ſoot 0.82
ts of a foot. For it is thus;
As 1.25 is to 1.128, ſo is 1 to 0.905; and ſo is
905 to Foot 0.815 parts.

PROB. VII.

e Circumference of a Cylinder given; to find how much in length will make a Foot-ſolid.

When the Circumference is given in Inches, the Proportion is;

As the Circumference is to 42.54, ſo is 12 to a Number; and ſo is that *4th* Number to the th required to make a Foot-ſolid.

2. But if the Circumference be given in foot-meaſure, then the Proportion is;

As the Circumference is to 3.545, ſo is 1 to a *4th* mber, and ſo is that *4th* Number to the length make a Foot-ſolid.

Example.

If a round Stone, or Tree, be 44 inches about; w much in length will make a foot? *Anſwer*, inches ,22 parts. For it is,

As 44 is to 42.54, ſo is 12 to 11.52; and ſo is ,52 to inches 11.22 parts of an inch.

But ſuppoſe the ſame was meaſured by foot-mea-e, and the Circumference found to be feet 3.67 rts; How much in length will make a foot? nſwer, foot 0.935 parts. For it is thus,

As 3.67 is to 3.545, ſo is 1 to 0.967; and ſo is 967 to foot 0.935 parts.

PROB.

PROB. VIII.

The Diameter and Length of a Cylinder given; to find its ſolid Content.

1. WHen the Diameter is given in Inches, and Length in Feet, the proportion is thus;

As 13.531 is to the Diameter, ſo is the Length t a 4*th* Number; and ſo is that 4*th* Number to th ſolid Content in feet.

2. If the Diameter and Length are both given i foot-meaſure, then the Proportion is thus;

As 1.128 is to the Diameter, ſo is the Length t a 4*th* Number; and ſo is that 4*th* Number to th Content required.

Example.

A round Piece of Timber 10 inches through, an 30 feet long; How many feet of Timber is in it *Anſwer*, feet 16.35 parts. For it is,

As 13.531 to 10, ſo is 30 to 22.18; and ſo 22.18 to feet 16.35 parts of a foot.

But ſuppoſe the ſame Piece meaſured by foot meaſure, then it's foot 0.83 parts through: And th Work is thus;

As 1.128 to 0.83, ſo is 30 to 22.18; and ſo 22.18 to feet 16.35 parts as before.

PROB. IX.

The Circumference and Length of a Cylinder given to find the ſolid Content.

1. IF the Circumference be given in inches, and Length in feet, the Proportion is thus;

A

As 42.54 is to the Circumference, ſo is the Length to a 4*th* Number; and ſo is this 4*th* Number to the ſolid Content in feet.

2. When the Circumference and Length are both in foot-meaſure, the firſt Term being 3.545, (inſtead of 42.54) the former words will ſerve here.

Example.

A round Stone, or Tree, being 30 inches about, and 25 feet long; How many feet ſolid is in it? *Anſwer*, feet 12.5 parts. For it is thus,

As 42.54 is to 30, ſo is 25 to 17.62; and ſo is 17.62 to feet 12.53 parts.

Now, the Compaſs about being taken in foot-meaſure, it's feet 2.50 parts; and the Proportion is,

As 3.545 to 2.50, ſo is 25 to 17.62; and ſo is 17.62 to feet 12.53 parts, as before.

Note 1. When Timber Tapers, that is, bigger at one end than t'other, it's uſual to take the Breadth and Depth in the middle of its Length; and by them to meaſure the Piece as if it were both ends of a bigneſs.

Note 2. The Proportions for foot-meaſure are the ſame when all the Dimenſions are taken in Inches; only the ſolid Content is found in Inches.

Note 3. The ſolid Content in inches, divided by 1728, the Quotient is feet; but if divided by 282, or 231, the firſt is Beer, and the latter is Wine Gallons: and how to divide by the Line of Numbers was ſhewed in *Prob.* 4. of the firſt Uſes of the Gunter.

PROB.

PROB. X.

The Diameter of a Cask at Head and Bung, an alſo its length given in Inches; to find its Conte in Gallons, Beer or Wine.

The Rule is thus;

1. AS 1 is to 0.7, ſo is the Difference of Bu and Head Diameters to a *4th* Numbe which being added to the Head-Diameter, the Su is a mean-Diameter, reducing the Cask to a Cyli der. Then ſay,

2. As the Gauge-Point (which for Beer or Al 18.95, but for Wine 17.15) is to the Mean-Diam ter, ſo is the Length to a *4th* Number; and ſo this *4th* Number to the Content in Gallons required.

Example.

Suppoſe a Cask whoſe Length is —— 40

Diameter at ——— { Bung 28 } Inch
{ Head 20 }

What's the Content of this Cask in Gallons, Beer Wine? *Anſwer*, 73 Gallons Beer, and Wine G lons 89.2 tenths. See the Work following:

Bung Diameter ——— 28 Inches.
Head Diameter —— 20
Their Difference is —— 8 Inches.

Then, As 1 to 0.7, ſo is 8 to 5.6; which added 20, the Head-Diameter, makes 25.6 for the Mea Diameter: Then ſay,

As { 18.95 } is to 25.6, ſo { 54. } ; and ſo is
{ 17.15 } is 40 to { 59.76 }

{ 54. } to { 73. Beer } Gallons,
{ 59.76 } { 89.2 Wine }

PRO

PROB. XI.

The Length of a Ship's Keel, and Breadth at the Beam given; to find her Tunnage.

IT's the Practice of the Shipwrights about *London*, to multiply the Length of the Keel, Breadth, and half-breadth into one another, and to divide the laſt Product by 94, whoſe Quotient they count for the Ship's Tunnage: from whence I frame this Proportion following to be wrought by the Line of Numbers.

1. As 188 is to the Breadth, ſo is the Breadth to a *4th* Number: then ſay,

2. As 1 is to that *4th* Number, ſo is the Length to the Tunnage required.

Example.

Suppoſe a Ship 72 feet by the Keel, and 24 feet by the Beam; I demand her Tunnage? *Anſwer*, Tuns 220.6 tenths neareſt: See the Work.

As 188 to 24, ſo is 24 to 3.06: And then,
As 1 is to 3.06, ſo is 72 to Tuns 220.6 tenths.

PROB. XII.

To find the Tunnage of a Box, Bale or Caſe, having its Length, Breadth, and Depth given.

The Rule is thus;

AS 66 is to the Breadth, ſo is the Depth to a *4th* Number: Then,

2. As 1 is to this *4th* Number, ſo is the Length to its Tunnage required.

Exam-

Example.

A Caſe, or Bale, being 6 feet broad, 4 feet deep, and 10 feet long; I demand its Tunnage? *Anſwer*, 3.63 parts. For it is,

As 66 is to 6, ſo is 4 to 0.363 : And then,
As 1 is to 0.363, ſo is 10 to tuns 3.63 parts.

PROB. XIII.

The Diameter of a Globe given; to find its ſolid Cont.

The Rule.

AS 1 is to the Diameter, ſo is 0.5236 to a 4*th* Number; and ſo is that 4*th* to a 5*th*; and ſo is this 5*th* to a ſolid Content required.

Example.

A Globe whoſe Diameter is 8 Inches; What's the ſolid Content? *Anſwer*, inches 268. For it is wrought thus,

As 1 to 8, ſo is 0.5236 to 4.19; and ſo is 4.19 to 33.5; and ſo is 33.5 to 268 Inches.

IV. *The Uſe of the Line of Numbers in Gunnery.*

PROB. I.

The Diameter and Weight of any Piece of Ordnance known; to find the Weight of any other, being of the ſame Metal and Shape, its Diameter being known.

Like Solids are in Proportion, as the Cubes of the agreeing Sides: therefore, *The Rule is thus*;

AS the Diameter of the known Gun is to the Diameter of the Gun whoſe Weight is required

ſo is the Weight of a known Gun to a 4*th* Number; and ſo is that 4*th* to a 5*th*, and ſo is that 5*th* to the Weight required.

Example. Suppoſe a Braſs-Saker, whoſe Diameter is inches 11.5 tenths, do weigh 1900 Pounds; what will a Braſs-Gun weigh, whoſe Diameter is inches 8.75 parts? *Anſwer*, 840 Pounds. For it is,

As 11.5 is to 8.75, ſo is 1900 to 1440; and ſo is 1440 to 1110; and ſo is 1110 to 840 Pounds.

That is, by *Gunter's Scale* with Compaſſes,

The Extent from the Diameter 11.5 to the Diameter 8.75, being laid three times from the Weight 1900, will reach to 840 Pounds, the Weight of the Gun required.

And by the *ſliding Gunter*, thus;

Set the Diameter 11.5 againſt the Diameter 8.75; then againſt the Weight 1900 on the firſt, is 1440 on the Second; and againſt 1440 on the firſt, is 1110 on the Second: Alſo againſt 1110 on the firſt, is 840 Pounds, the Weight required.

PROB. II.

Having the Diameter and Weight of one Piece of Ordnance, and the Diameter of another Piece of another Metal; to find the Weight of the laſt, it being of the ſame Shape with the former.

The Rule is thus;

1. FInd the Weight of the Piece, as if it had been of the ſame Metal the propounded Piece is; by the laſt *Prob.* Then,

2. Conſider the Proportions of Metals; which are theſe, according to the beſt Authors:

Braſs	}		*Iron*	}	9	}	8.
Lead	}	is	*Iron*	}	3	}	2.
Lead	}	to	*Stone*	}	As 4	}	is to 1.
Iron	}		*Stone*	}	8	}	3.

3. Having the Weights of both Peices in one ſort of Metal, you muſt then proportion their Weights according to their different Metals, by the proportional Numbers of thoſe Metals; and then it's done.

Example. If a Braſs Saker of Inches 11.5 tenths, weighs 6000; What will an Iron-Gun (of the ſame Shape) weigh, whoſe Diameter is Inches 8.75 parts? *Anſwer*, 746 Pounds. For it is wrought thus,

1. I find by *Prob.* 1. that a Braſs Piece, of inches 8.75, will weigh 840 Pounds; but becauſe this Piece is Iron, and the Proportion of Braſs to Iron (as aboveſaid) is as 9 to 8: therefore ſay;

2. As 9 is to 8; ſo is 840 to 746 Pounds.

PROB. III.

By knowing the allowance of Powder for one Gun; to find how much of the ſame Powder is requiſite for another Gun.

The Rule.

AS the Diameter of the Bore of the Gun whoſe Allowance is known, is to the Diameter whoſe Allowance is required; ſo is the Allowance given to a 4*th* Number; and ſo is that 4*th* to a 5*th*; and ſo is this 5*th* to the allowance required.

But note; Here it's underſtood, that both Guns are alike fortified; that is, they ſhould have the ſame Proportion in Weight, and Thickneſs of Metal.

Example. If a Saker of inches 3.5 tenths Bore, re-

quir

quire 4 Pound of Powder; What will a Demi-Cannon of inches 6.5 tenths Bore require? *Anſwer*, Pounds 25.58 parts. For it is,

As 3.5 is to 6.5 ſo is 4 to 7.44; and ſo is 7.44 to 13.82; and ſo is 13.82 to pounds 25.58 parts, the Weight of Powder for the Demi-Cannon in Proportion to the given Saker. But ſuppoſe the Weight of the Saker is 1600, and the Weight of the Demi-Cannon 6000; What allowance of Powder muſt it then have?

1. By *Prob.* 1. find the Weight of the Demi-Cannon in Proportion to the Saker's Weight; which is thus;

As 3.5 to 6.5, ſo is 1600 to 2960; and ſo is 2960 to 5500; and ſo is 5500 to 10020 Pounds, the Weight of the Demi-Cannon requiring pounds 25.58 parts of Powder for its Loading. But ſeeing its Weight is ſuppoſed to be 6000; ſay,

2. As 10020 is to 6000, ſo is 25.58 to pounds 15, the due Allowance of Powder for the Demi-Cannon of inches 6.5 tenths Bore, and weighing 6000 pounds; at the rate a Saker inches 3.5 tenths Bore, weighing 1600 pounds, doth require 4 pounds of Powder.

PROB. IV.

Having the Diameter and Weight of one Bullet, and the Diameter of another of the ſame Metal given; to find the Weight of the latter.

The Rule.

THe Weights of Bullets (of the ſame Metal) are in Triplicate Proportion of their Diameters; and wrought by Directions in *Prob.* 10. of the firſt

Uſes of the Gunter.

Example. If an Iron-Bullet 4 inches Diameter weigh 9 pounds; What will an Iron-Bullet of 6 inches Diameter weigh? *Anſwer*, pounds 30.3 tenths. For it is thus;

As 4 to 6, ſo is 9 to 13.5; and ſo is 13.5 to 20.2; and ſo is 20.2 to pounds 30.3 tenths.

PROB. V.

Two Bullets equal in Diameter, but of differing Metal; by the Diameter and Weight of one, to find the Weight of the other.

The Rule.

AS the Proportion of one Metal is to the other, ſo is the Weight of the given Bullet to the Weight of the Bullet required.

Example.

Suppoſe an Iron-Bullet 6 inches Diameter, weigh pounds 30.3 tenths; what will a Stone-Bullet of the ſame Diameter weigh? *Anſwer*, pounds 11.36 parts. For it is wrought thus;

By *Prob.* 2. of Gunnery, the Proportion of Iron and Stone is as 8 to 3: therefore ſay,

As 8 is to 3, ſo is 30.3 to pounds 11.36 parts.

PROB. VI.

Having the Diameter and Weight of a Bullet of one kind of Metal, and the Diameter of another Bullet of another Metal, given; to find the Weight of the latter.

The Rule.

1. FInd the Weight of it (by *Prob.* 4.) as if it were of the ſame Metal.

2. Then

2. Then find its Weight according to the Proportion of the Metals by the laſt Problem, and it's done.

Example 2.

If an Iron-Bullet 4 inches Diameter weigh 9 pounds; What is the Weight of a Leaden-Bullet 6 inches Diameter? *Anſwer*, pounds 45.45 parts. Fot it is thus wrought;

1. As 4 to 6, ſo is 9 to 13.5; and ſo is 13.5 to 20.2; and ſo is 20.2 to pounds 30.3 tenths, if it had been Iron: but being it's Lead, ſay,

2. As 2 is to 3, ſo is 30.3 to pounds 45.45 parts, the Weight being Lead.

V. *The Uſe of* Gunter's-*Scale in Navigation; and firſt in Plain Sailing.*

CASE I.

Courſe and Diſtance ſailed given, to find the Difference of Latitude and Departure from the Meridian.

To do this, the Proportions are theſe;

1. AS Radius is to the Diſtance ſail'd, ſo is the Sine of the Courſe to the Departure from the Meridian.

2. As Radius is to the Diſtance ſail'd, ſo is the Sine-Complement of the Courſe to the Difference of Latitude.

Note; The Radius, according to the Nature of the Proportion, may be any of theſe;

8 Points, 4 Points, 90 Degrees, 45 Degrees } on the Line of { Sine Rumbs. Tangent Rumbs. Sines. Tangents.

And for conveniency that each Proportion may ſtand in one Line,

Let S. S. c. T. T. c. Cr. Diſt. Diff.Lat. Dep. } ſtand for { Sine. Sine Complement. Tangent. Tangent Complement. Courſe. Diſtance ſail'd. Difference of Latitude. Departure from the Merid.

Example.

If a Ship ſails S. W. by S. 104 Minutes from Latitude 1 d. 45 m. North; I demand what Latitude ſhe is in, and her Departure from the Meridian?

As S. 8 Points to { 3 / 5 } Points to { Dep. 58 M. / Diff.Lat. 86 M.
104 M. ſo is S.

By Gunter with Compaſſes.

The Extent from 8 Points (on the Line of Sine Rumbs) to 104 M. (on the Line of Numbers) will reach (the ſame way) from 3 Points (on the Line of Sine Rumbs) to 58 M. (on the Line of Numbers) which is the Departure from the Meridian. And the Compaſſes kept at the ſame Diſtance, will reach (the

(the ſame way) from 5 Points (on the Line of Sine Rumbs) to 86 M. (on the Line of Numbers) which is the Difference of Latitude.

Note; The Courſe is 3 Points, becauſe S. W. by S. is 3 Points from the Meridian or South; and 5 Points is the Complement of the Courſe, becauſe S. W. by S. is 5 Points from the Parallel or Weſt: underſtand the like in any other Courſe.

By ſliding Gunter.

Bring 8 Points (on the lower out-ſide piece) againſt 104 M. (in the Line of Numbers on the middle piece); then againſt 3 Points (on the firſt) is 58 M. (on the ſecond) the Departure from the Meridian: and againſt 5 Points (on the firſt) is 86 M. (on the ſecond) the Difference of Latitude.

	d.	m.	
Latitude departed from —— ——	1	45	North.
Difference of Latitude 86 M. or —	1	26	Southerly.
Subtract, gives Latitude required —	0	19	North.

CASE II.

Courſe and Difference of Latitude given; to find the Diſtance ſail'd, and Departure from the Meridian.

To do this, the Proportions are theſe;

As S. c. Cr. is to Diff. Lat. ſo is { Radius / S. Cr. } to the { Diſt. / Dep. }

Example.

Suppoſe a Ship ſails N. N. E. from the Latitude of 2 *d.* 15 *m.* South, and then, by Obſervation, is in Lati-

Latitude 1 d. 22 m. North; What is her Distance sail'd, and Departure from the Meridian?

	d.	m.	
Latitude departed from	2	15	South.
Latitude by Observation	1	22	North.
Added, gives the Difference of Latit.	3	37	

The Difference of Latitude 3 d. 37 m. reduced into Minutes by multiplying by 60, is 217 Minutes: Then,

As S. 6 Points is { 8 } Points to { 234 the Dist.
to 217 M. so is S. { 2 } { 90 the Dep.

CASE III.

Course and Departure from the Meridian given; to find the Distance and Difference of Latitude.

This is performed by these Proportions;

As S. Cr. is to { Radius } to the { Distance.
the Dep. so is { S. c. Cr. } { Diff. Lat.

Example.

If a Ship sails S. E. by E. from 1 d. 10 m. North-Latitude, till her Departure be 92 Minutes; What is her Distance sail'd, and Latitude she is in?

As S. 5 Poin. is { 8 } Points to { 110 the Dist.
to 92 m. so is S. { 3 } { 61 the Diff. Lat.

CASE IV.

Distance and Difference of Latitude given; to find the Course and Departure from the Meridian.

The Proportions are these;

1. AS the Distance sail'd is to Radius, so is the Difference of Latitude to the Sine-Complement of the Course.

2. As

2. As the Radius is to the Diſtance ſail'd, ſo is the Sine of the Courſe to the Departure from the Meridian.

Example.

Admit a Ship ſails South Weſtward 98 Leagues from the *Lizard*, in Latitude 50 d. 10 m. North; and then, by Obſervation, is in 46 d. 50 m. North-Latitude: What is her Courſe and Departure from the Meridian?

	d.	m.	
Latitude departed from——	50	10	North.
Latitude by Obſervation ——	46	40	North.
The Difference of Latitude—	3	30	or 70 Leagues.

1. As 98 Leag. is to 90 d. ſo is 70 Leag. to 45 d. 30 m. whoſe Complement 44 d. 30 m. is the Courſe from the South Weſtward; that is, S. W. neareſt: Then,

2. As S. 90 d. is to 89 Leag. ſo is S. 44 d. 30 m. to 68 Leagues, the Departure from the Meridian.

By Gunter with Compaſſes.

1. The Extent from 98 Leag. (in the Line of Numbers) to 90 degrees (in the Line of Sines) will reach the ſame way from 70 Leag. (in the Line of Numbers) to 45 d. 30 m. (in the Line of Sines), which being ſubtracted from 90 deg. leaves 44 deg. 30 min. for the Courſe.

2. The Extent from 90 deg. (in the Line of Sines) to 89 leag. (in the Line of Numbers) will reach from 44 deg. 30 min. (in the Line of Sines) to 68 leag.

leag. (in the Line of Numbers), which is the Departure from the Meridian.

By ſliding Gunter.

1. Bring 98 leag. (in the Line of Numbers, and on the middle piece) againſt 90 deg. (in the Line of Sines, on the out-ſide piece); then right againſt 70 leag. on the firſt, is 45 deg. 30 min. on the ſecond, which is the Complement of the Courſe.

2. And as it now ſtands againſt 44 deg. 30 min. (in the Line of Sines, on the out-ſide piece) is 68 leag. (in the Line of Numbers, on the middle piece), which is the Departure as before.

CASE V.

Diſtance and Departure given; to find the Courſe and Difference of Latitude.

The Operations are as follow;

1. AS the Diſtance ſail'd is to Radius, ſo is the Departure to the Sine of the Courſe.

2. As Radius is to the Diſtance ſail'd, ſo is the Sine-Complement of the Courſe to the Difference of Latitude.

Example.

A Ship runneth 354 Minutes North Eaſtward from 1 d. 19 m. South-Latitude, until her Departure be 150 Minutes; What is her Courſe and Latitude ſhe is in?

1. As 354 min. is to S. 90 deg. ſo is 150 min. to Sine 25 deg. the Courſe North Eaſtward, or N. N. E. ¼ E.

2. A

2. As S. 90 deg. is to 354 min. ſo is S. 65 deg. to 323 min. the Difference of Latitude.

	d.	m.	
Latitude departed from, is——	1	19	South.
The Difference of Latitude 323 min. or	5	23	
Subtract, gives Latitude the Ship is in	3	4	North.

CASE VI.

Difference of Latitude and Departure given; to find the Courſe and Diſtance.

To do this, theſe are the Proportions;

1. AS the Difference of Latitude is to the Departure from the Meridian, ſo is Radius to the Tangent of the Courſe.

2. As the Sine of the Courſe is to the Departure from the Meridian, ſo is Radius to the Diſtance ſail'd.

Example.

Sailing between the North and the Weſt, from 1 d. 59 m. South-Latitude, and then arriveth at another Port which is in 3 d. 8 m. North Latitude, and is alſo 209 minutes to the Weſtward of the firſt Port; I demand the Coruſe and Diſtance from the firſt Port to the ſecond?

	d.	m.	
Latitude of the firſt Port——	1	59	South.
Latitude of the ſecond Port——	3	8	North.
Added, gives Diff. Latitude—	5	7 or 307 min.	

1. As 307 m. is to 209 min. ſo is tang. 45 deg. to tang. 34 deg. 15 min. the Courſe North Weſtward, or N. W. by N. neareſt.

2. As

2. As S. 34 d. 15 m. is to 209 min. ſo is S. 90 d. to 370 m. the Diſtance between the Ports.

By Gunter with Compaſſes.

1. The Extent from 307 min. to 209 min. (in the Line of Numbers) will reach from 45 deg. (in the Line of Tangents, that now being the Radius) to 34 deg. 15 min. (in the ſame Line of Tangents) which is the Courſe from the Meridian.

Note, if the { Diff. Lat. / Depart. } be greateſt, { leſs / more } than 45 deg. from the Meridian.

2. The ſecond Canon for the Diſtance is wrought as in *Caſe* the 3*d*.

By ſliding Gunter.

1. In this Caſe ſo put in the middle piece, that a Tangent-Line may ſlide by and next a Tangent-Line, alſo Numbers againſt Numbers: Then bring 307 min. (in the Line of Numbers on the middle piece) againſt 209 min. (in the Line of Numbers on the out-ſide piece) then againſt 45 deg. (in the Line of Tangents on the middle piece) is 34 deg. 15 min. (in the Tangents on the out-ſide piece), which is the Courſe required.

2. For the Diſtance, the manner of working is the ſame as hath been ſhewed in Caſe 1*ſt*, 2*d* or 3*d*.

To reſolve a Traverſe by Gunter.

Example 1.

A Ship in Latitude 40 d. North, and Longitude 5 d. 24 m. Weſt; ſhe ſails firſt S. E. by S. 68 Minutes

nutes, then S. W. by W. 55 Minutes, and then W. N. W. 75 Minutes; I demand the Courſe and Diſtance from the firſt Place of Departure, and what Latitude and Longitude ſhe is now in?

To do this, firſt find the Difference of Latitude and Departure from the Meridian for each ſeveral Courſe, as directed in *Caſe* 1. of Plain Sailing.

2. Collect the ſeveral Differences of Latitude, whether North or South, into one Sum; and in like manner, the ſeveral Departures either Eaſt or Weſt; aking the Difference of the Northing and Southing or the Difference of Latitude, and the Difference of he Eaſting and Weſting for the Departure from the Meridian.

3. Having now the Difference of Latitude, and he Departure known, the Courſe and Diſtance may e found by the 6th *Caſe* of Plain Sailing.

4. The Difference of Longitude may be found by his Proportion;

As the Sine-Complement of the middle Latitude s to the Departure from the Meridian, ſo is Radius o the Difference of Longitude. See the Work llowing.

	Pts.	M.
Courſe. As S. 8 Points	3	to 38 Eaſting.
to 68 m. ſo S.	5	to 57 Southing.
Courſe. As S. 8 Points	5	to 46 Weſting.
to 55 m. ſo S.	3	to 30.6 Southing.
Courſe. As S. 8 Points	6	to 69.5 Weſting.
to 75 m. ſo S.	2	to 28.8 Northing.

Courſes

Courſes	Diſt.	Diff. Lat. North	Diff. Lat. South	Departure. East	Departure. Weſt
1. S. E. by S.	68		57.	38.	
2. S. W. by W.	55		30.6		46.
3. W. N. W.	75	28.8			69.5
			87.6		115.5
			28.8		38.
	Diff.	Lat.	58.8		77.5

Dep. Then

m. m. d. d. m

3. As 58.8 is to 77.5, ſo is T. 45 to T. 52.50 the Courſe from the South towards the Weſt; tha is, S. W. $\frac{3}{4}$ W. almoſt. And again,

As S. 52 d. 50 m. is to 77.5, ſo is S. 90 d. t 97 m. the Diſtance from the firſt Place of Departure.

	d.	m.	
Latitude departed from ———	40	0	North.
The Difference of Latitude 58.8 or	0	59	Southerly
Subtract, gives Lat. the Ship is in	39	1	North.
Therefore the middle Latitude is	39	30	
Subtracted from ———	90	0	
Makes Comp. of middle Latitude	50	30	

4. As S. 50 d. 30 m. is to 77.5, ſo is S. 90 d. t 100 m. the Difference of Longitude.

	d.	m.	
The Longitude departed from, is	5	24	Weſt.
The Difference of Longit. 100 m. or	1	40	Weſtin
Added, gives the Long. the Ship is in	7	14	Weſt.

Exan

Example 2.

A Ship in Latitude 41 d. 30 m. North, and Longitude 10 d. 20 m. Eaſt, ſails theſe ſeveral Courſes and Diſtances, *viz.* S. E. by S. 52 minutes, then S. S. W. 63 m. E. by N. 47 m. N. by E. $\frac{1}{4}$ E. 35 m. N.N.W. $\frac{1}{4}$ W. 47 m. W.N.W. 73 m. I demand the Courſe and Diſtance from the firſt Place of Departure, alſo the Latitude and Longitude ſhe is in?

1. For the doing of which, obſerve the Work following:

		M.	Points.	M.
1		52	3	28.8 E.
			5	43.2 S.
2		63	2	24.2 W
			6	58.5 S.
3		47	1	46.2 E.
			7	9.2 N.
	Courſe. As S.8 Po. is to		So is S.	to
4		35	1 $\frac{1}{2}$	10.2 E.
			6 $\frac{1}{2}$	33.6 N.
5		47	2 $\frac{1}{4}$	20. W.
			5 $\frac{3}{4}$	42.5 N.
6		73	6	68. W.
			2	28. N.

2. Then collect the ſeveral Northings, Southings, Eaſtings and Weſtings into one, as here you ſee in the Table following; whereby you will have the Difference of Latitude and Departure from the Meridian.

Courſes

Courſes	Diſt.	Diff. Latit. North	Diff. Latit. South	Departure Eaſt	Departure Weſt
1. S. E. by S	52		43.2	28.8	
2. S. S. W.	63		58.5		24.2
3. E. by N.	47	9.2		46.2	
4. N. by E. $\frac{1}{2}$ E.	35	33.6		10.2	
5. N. N. W $\frac{1}{4}$ W.	47	42.5			20.
6. W. N. W.	73	28.			68.
		113.3	101.7	85.2	112.2
		101.7			85.2
Differ. Latitude		11.6	Departure		27.0

3. Now having the Diff. Lat. and the Departure known, the Courſe and Diſtance is thus found;

m. m. d. d. m.

As 11.6. is to 27, ſo is T. 45 to T. 66.40: The Courſe from the North Weſtward, or W. N. W. neareſt.

Here obſerve the Courſe is more than 45 degrees from the Meridian, becauſe the Departure is more than the Difference of Latitude; according to the Note in the 6th *Caſe* of Plain Sailing: Then for the Diſtance, ſay,

d. m. m. d. m.

As S. 66.40 is to 27, ſo is S. 90 to 29.5: The Diſtance from the firſt Place of Departure.

	d.	m.	
Latitude departed from	41	30	North.
The Diff. Lat. 11. 6 m. or		12	North.
Added, gives the Latit. the Ship is in	41	42	North.
And the middle Latitude is	41	36	
Subtract it from	90		
Leaves Compl. of middle Latitude	48	24	

4. Then to find the Difference of Longitude, ſay, As S. 48 d. 24 m. is to 27 m. ſo is S. 90 d. to 36 m. the Difference of Longitude.

	d.	m.	
The Longitude departed from is	10	20	Eaſt.
The Difference of Longitude 36 m. or		36	Weſt.
Subtract, gives the Long. the Ship is in	9	44	Eaſt.

Secondly, in Mercator's Sailing.

CASE I.

The Latitude and Longitude of two Places given; to find their Courſe and Diſtance.

Example.

I demand the Courſe and Diſtance from the *Lizard* to *Barbadoes*, their Latitudes and Longitudes being ſuppoſed to be as follows:

		d. m.		d. m.	
Lizard	Latit.	50.10	North.	Long. 5.24	W.
Barbadoes	Latit.	13.10	North.	Long. 57.24	W.
The diſt. Latitude		37.	South.	diſt. long. 52.	W.
		60		60	
		Minutes 2220		Minutes 3120	

R To

To anſwer this Queſtion, the Proportions are theſe;

1. As the Meridional Difference of Latitude is to the Difference of Longitude, ſo is Radius to the Tangent of the Courſe.

2. As the Sine-Complement of the Courſe is to the Difference of Latitude, ſo is Radius to the Diſtance of the two Places.

The Meridional Difference of Latitude is thus found; Extend the Compaſſes in the Meridian-Line from one Latitude to the other; that Extent meaſured in the Equinoctial-Line (the Line next joining to the Meridian-Line) gives the Meridional Difference of Latitude.

Thus the Extent from Lat. 50 d. 10 m. to Lat 13 d. 10 m. in the firſt, being meaſured on the latter is 45 deg. or 2700 min. the Meridional Difference o Latitude: Then it is,

d. d.

As 2700 m. is to 3120 m. } ſo is T. 45 to T. 49. Th
Or, As 45 d. is to 52 d. }

Courſe from the South Weſtward, or S. W. 4 deg Weſterly. And again,

As S. 41 is to 2220 m. ſo is S. 90 d. to 3390 m.

Or, As S. 41 d. is to 37 d. ſo is S. 90 d. to 56 d 30 m. ſo that the Diſtance is 56 d. 30 m. or 339 minutes.

CAS

CASE II.

Both Latitudes and Course given; to find the Distance and Difference of Longitude.

The Proportions are these;

1. AS the Sine-Complement of the Course is to the Difference of Latitude, *&c.* as before in the 2d Case of plain Sailing, to find the Distance and the Departure from the Meridian.

2. As the Sine-Complement of the middle Latitude is to the Departure, so is Radius to the Difference of Longitude.

Or thus, As the Sine-Complement of the Course is to the Meridional Difference of Latitude, so is the Sine of the Course to the Difference of Longitude.

Example.

Admit from the *Lizard* in 50 d. 10 m. North-Latitude, and Longitude 5 d. 24 m. West, we made (when Lee-way Variation allowed for) our Course to be South 39 d. Westerly, and then, by Observation, is in Latitude 45 d. 11 m. North; I demand her Distance run, and what Longitude she is in?

Latitude departed from———	50 d.	10 m.	North.
Latitude by Observation———	45	11	North.
Subtract, is the Diff. Latitude	4	59	Southerly.
		60	
	minutes	299	
The middle Latitude is———	47 d.	40 m.	
Subtract from ———————		90	
Leaves Comp: of the mid. Lat.	42	20	

1. As S. 51 d. is to 299 m. ſo is S. { 90 / 39 } d. to { 385 m. Diſt. / 242 m. Dep.

2. As S. 42 d. 20 m. is to 242 m. ſo is S. 90 d. to 358 m. the Difference of Longitude: or thus, The Extent from 50 d. 10 m. to 45 d. 11 m. in the Meridian-Line, meaſured in the equal Parts, is 7 d. 20 m. or 440 m. for the Meridional Difference of Latitude. Then,

As S. 51 d. is to 440 m. ſo is S. 39 d. to 358 m.

Or thus,

As 299 m. is to 242 m. ſo is 440 m. to 358 m. as before, which is the Difference of Longitude.

	d.	m.	
The Longitude departed from——	5	24	Weſt.
The Difference of Long. 358 m. or——	5	58	Weſt.
Added, gives the Long. the Ship is in—	11	22	Weſt.

CASE III.

Both Latitudes, and Diſtance given; to find the Courſe and Difference of Longitude.

To perform this, the Proportions are theſe;

1. AS the Diſtance is to Radius, ſo is the Difference of Latitude to the Sine-Complement of the Courſe; as in the 4th Caſe of Plain Sailing, by which alſo you may find the Departure or Meridional Diſtance.

2. As the Sine-Complement of the middle Latitude is to the Departure, ſo is Radius to the Difference of Longitude: Or thus,

As

As the Difference of Latitude is to the Departure, ſo is the Meridional Difference of Latitude to the Difference of Longitude.

Example.

A Ship in Latitude 46 d. South, and Longitude 1 d. 15 m. Weſt, ſails 100 Leagues North Eaſtward,; and then by Obſervation is in Latitude 42 d. South I demand her Courſe, Departure, and Longitude ſhe is in?

Latitude departed from is 46 d. South.
Latitude by Obſervation is-42 d. South.

Subtract, gives the diff. lat. 4 d. or 80 Leagues.

The middle Latitude is——44 d. whoſe Comp. is 46 d.

1. As 100 leag. is to S. 90 deg. ſo is 80 leag. to S. 53 deg. 15 min. the Complement of the Courſe; ſo that the Courſe is 36 deg. 45 min. North Eaſtward, or N. E. by N. $\frac{1}{4}$ E. And then again,

As S. 90 d. is to 100 leag. ſo is S. 36 deg. 45 min. to 60 leag. the Departure from the Meridian.

2. As S. 46 deg. is to 60 leag. ſo is S. 90 deg. to 83 leag. the Difference of Longitude: Or thus; The Extent from 46 d. to 42 deg. on the Meridian-Line, makes 5 deg. 30 min. or 100 leag. (on the equal Parts) which is the Meridional Difference of Latitude: And then it is,

As 80 leag. is to 60 leag. ſo is 110 leag. to 83 leag. } diff. long.
Or, As 4 deg. is to 3 d. ſo is 5 d. 30 m. to 4 d. 9 m. }

Longitude departed from is——— 1 d. 15 m. Weſt.
The Diff. of Longitude 83 leag. or——4 d. 9 m. Eaſt.

Subtract, gives Longitude Ship is in 2 d. 54 m. Eaſt.

CASE IV.

Both Latitudes and Departure given; to find the Courſe, Diſtance, and Difference of Longitude.

1. THe Courſe, and Diſtance, is found by the *6th* Caſe of Plain Sailing.

2. The Difference of Longitude is found as in the laſt Caſe, or any other Caſe in *Mercator*.

Example.

A Ship in Latitude 33 d. North, and Longitude 178 d. Weſt, ſhe ſails South Weſtward until ſhe be departed from the Meridian 58 Leagues, and then ſhe is in Latitude 28 d. 36 m. North; I demand her Courſe, Diſtance, and what Longitude ſhe is in?

	d.	m.	
Latitude departed from —	33		North.
Latitude ſhe is in —	28	36	North.
The Difference of Latit. is--	4	24	or 88 Leagues.
The middle Latitude is —	30	48	the Comp. 59 12.

1. As 88 leag. is to 58 leag. ſo is T. 45 d. to T. 33 d. 20 m. which is the Courſe South-Weſterly, or S. W. by S.

2. As S. 33 d. 20 m. is to 58 leag. ſo is S. 90 d. to 105 leag. the Diſtance ſail'd.

3. The Meridional Difference of Latitude is 5 d. 10 m. or 103 leag.

4. As { S. 59 d. 12 m } is to 58 Leagues, { S. 90 d. } { 88 Leagues } ſo is { 103 leag. } to 67 Leagues, the Difference of Longitude.

5. Long-

	d.	m.	
5. Longitude departed from is—	178	0	West.
The Diff. of Long. 67 leag. or ——	3	21	West.
Added, and the Sum is ——	181	21	
Which subtract from ——	360	0	
Remainder is Long. the Ship is in—	178	39	East.

CASE V.

One Latitude, Course and Distance given; to find the other Latitude and Difference of Longitude.

1. THE Difference of Latitude, and Departure from the Meridian is found by the first Case of Plain Sailing; and consequently the other Latitude.

2. The Difference of Longitude is found as before in the 2*d* or 3*d* Case of *Mercator*

Example.

If a Ship sails S. E. by S. 120 Leagues, from a Port in Latitude 53 d. 30 m. North, and Longitude 2 d. 15 m. West; What Latitude, and Longitude is she now in?

1. As S. 8 Pts. to 120 leag. so is S. { 5 / 3 } Pts to { 100 leag. diff. lat. / 67 leag. Depart.

	d.	m.	
2. Latitude departed from is—	53	30	North.
The Diff. of Lat. 100 leag. or	5		
Subtract, gives Lat. she is in	48	30	North.
And the middle Latitude is	51		Comp. 39 d.

3. The Meridional Diff. Lat. is 8 d, or 160 Leagues.

4. As { S. 39 d. / 100 leag. } is to 67 leag. so is { S. 90 d. / 160 leag. } to 106 leag. 5 Difference of Longitude.

	d.	m.	
5. Longitude departed from is——	2	15	West,
The Diff. long. 106,5 leag. or--	5	20	Easting.
Subtract, gives Longit. she is in--	3	5	East.

CASE VI.

Sailing in any Parallel; to find the Difference of Longitude.

To do this, the Proportion is thus;

AS the Sine Complement of the Parallel or Latitude is to the Distance sail'd (East or West), so is Radius to the Difference of Longitude.

Example.

If a Ship sails West 390 minutes in the Latitude of 50 d. 10 m. and departs from the Longitude of 2 d. 45 m. East; I demand what Longitude the Ship is now in?

1. As S. 39 d. 50 m. is to 390 m. so is S. 90 d. to 610 m. the Difference of Longitude.

	d.	m.	
2. Longitude departed from is——	2	45	East.
The Diff. Long. 610 m. or ——	10	10	Westing.
Subtract, gives Long. she is in——	7	25	West.

CASE

CASE VII.

The Difference of Longitude given, of two Places in one Parallel or Latitude; to find their Diſtance in that Parallel.

The Proportion is thus;

AS Radius is to the Difference of Longitude, ſo is the Sine-Complement of the Latitude to the Diſtance in that Parallel.

Example 1.

Suppoſe *Cape-Vincent* in *Portugal*, and *Cape Henry* in *Virginia*, both in the Latitude of 37 d. North; their Longitudes are ſuppoſed to be as follows;

Cape *St.* Vincent } *Longitude* { 8 d. 25 m. Weſt.
Cape Henry——— } { 74 d. Weſt.

What is their Diſtance in their Parallel?

	d.		d.	m.	
1. Latitude is	37	North,	8	25	Weſt.
		Longitudes are			
Take from	90		74		Weſt.
Comp. Lat.	53	The Diff. Long. is	65	35	

	d.	d.	d. m.		d. m.	
2. As S.	90	is to S. 53, ſo is	65 35 / 3935 m.	to	52 30 / 3150 m.	the

Diſtance required.

Example 2.

Suppoſe two Ships under the Equinoctial, and 100 Leagues aſunder, and each ſails North till both come into

into Latitude 60 d; How far are they now aſunder? *Anſwer*, 50 Leagues. For it is,

As S. 90 d. is to S. 30 d. ſo is 100 leag. to 50 leag. the diſtance required.

CASE VIII.

To find how many Minutes or Miles make a Degree of Longitude, in any Parallel or Latitude.

The Rule.

AS Radius is to the Sine-Complement of the Latitude, ſo is 60 minutes (a degree in the Equinoctial) to the minutes making a degree of Longitude required.

Example.

In the Latitude of 50 d. I demand how many minutes (of Eaſting or Weſting) make a degree of Longitude? *Anſwer*, 38 ½ minutes. For it is,

d. d. m. m.

As S. 90 is to S. 40, ſo is 60 to 38. 5 or 38 ½, to make one degree of Longitude in Latitude 50 d.

This may be done by the Plain Scale thus.

☞ Take the given Latitude from the Chords, and meaſured on the Line M. L. (which is miles of longitude) ſheweth your deſire: ſo here take 50 d. from the Chords, and meaſure on the Scale M. L. it ſheweth 38 ½ m. as before.

VI. *Th*

I. *The Use of* Gunter's *Scale in Astronomy.*

PROB. I.

The Sun's Place in the Ecliptick, and his greatest Declination given; to find his right-Ascension, and Present-Declination.

To perform this, these are the Proportions;

AS Radius is to the Sine-Complement of the Sun's greatest Declination, so is the Tangent his Longitude (from the nearest Equinoctial int) to the Tangent of his Right-Ascension (from e said Point).

ote 1. The Sun's greatest Declination is 23 d. 30 m.

The beginning of ♈ and ♎ are the two Equinoctial Points.

This Proportion (above) finds the Sun's Right-Ascension only when he is in the first-quarter of the Ecliptick: that is, ♈, ♉, or ♊: But when he is in the second-quarter, ♋, ♌ or ♍, subtract it from 180 d: and when in ♎, ♏ or ♐, add it to 180 d: And in the last-quarter, ♑, ♒ or ♓, subtract (what's found by this Operation) from 360 d. so will you have the Sun's Right-Ascension from ♈ (for any Place of the Ecliptick) desired.

2. As Radius is to the Sine of the Sun's Longide (from the nearest Equinoctial Point), so is the

Sine

Sine of his greateſt Declination to the Sine of hi preſent Declination.

Note; The Sun being in ♈, ♉, ♊, ♋, ♌ or ♍, hi Declination is North; but in ♎, ♏, ♐, ♑, ♒ or ♓ it's South.

Example.

When the Sun's Place in the Ecliptick is ♉ 24 d 15 m. What is his right Aſcenſion, and Declination?

The Sun being in ♉ 24 d. 15 m. his Longitud from the neareſt Equinoctial-Point (being now th beginning of ♈) is 54 d. 15 m. And the Compl ment of his greateſt Declination always is 66 30 m. Then it follows;

1. As S. 90 d. is to S. 66 d. 30 m. ſo is T. 54 15 m. to T. 51 d. 50 m. the Sun's Right-Aſcenſi (from the beginning of ♈) req ired.

By Gunter with Compaſſes.

The Extent from 90 d. to 66 d. 30 m. in t Line of Sines, will reach in the Line of Tange from 54 d. 15 m. to 51 d. 50 m. the Right-Aſce ſion.

By ſliding Gunter.

1. Let the middle Piece be ſo put in, that Sin may ſlide againſt Sines, and Tangents againſt Ta gents.

2. Then bring 90 d. in Sines (on the out-ſi Piece) againſt 66 d. 30 m. in Sines (on the mid Piece); then againſt 45 d. 15 m. in Tangents (the ſecond Piece) is 51 d. 50 m. in Tangents (the out-ſide Piece), the Right-Aſcenſion as above.

T

This Proportion being to be wrought on Sines and Tangents jointly, I thought it neceſſary to expreſs the manner of its Operation on both ſorts of Gunters, that the Learner might ſee how it agrees with the General-Rule given at the beginning of this Diſcourſe of the Gunter; but ſhall wave it in the reſt, and only write the Proportions in Words and in Figures, according to the particular Examples; as here follows for the Sun's Declination in the foregoing Example.

2. As S. 90 d. is to S. 54 d. 15 m. ſo is S. 23 d. 30 m. to S. 18 d. 52 m. the Sun's Declination North.

PROB. II.

The Latitude of a Place, and the Sun's Declination given; to find his Amplitude, and Aſcenſional Difference; and conſequently his Riſing or Setting, and the Length of the Day or Night.

To perform this Problem, the Proportions are theſe;

1. AS the Sine Complement of the Latitude is to Radius, ſo is the Sine of the Sun's Declination to the Sine of his Amplitude.

Note, The Amplitude and Declination are always of one kind; that is, both North or both South.

2. As Radius is to the Tangent of the Latitude, ſo is the Tangent of the Sun's Declination to the Sine of his Aſcenſional Difference.

Note 1. The Aſcenſional Difference (being reduced into Time, by allowing 15 degrees for one hour, and then) added to, and ſubtracted from 6 hours,

6 hours, the one is Sun-riſing, the other is Setting.

2. If Latitude and Declination are both North, o both South, the Sun riſeth before, and ſets afte 6 of the clock; but if one be North, and the o ther South, the contrary.

3. If the Riſing and Setting be doubled ſeverally the firſt is the length of the Night, and the latte the length of the Day.

4. By this Problem were the Tables of Amplitudes and Semidiurnal Arches, *&c.* calculated.

Example.

Latitude 51 d. 32 m. North, and the Sun's Decli nation 23 d. 30 m. North; I demand his Amplitud and Aſcenſional Difference? alſo his Riſing, Setting Length of the Day and Night?

	d.	m.		d.	m.
Anſw. His Amplitude	39	50,	Aſcenſi. Diff.	33	1
Sun-ſetting hr.	8	13,	length of Day	16	2
Sun-riſing hour	3	47,	length Night	7	3

For it is thus,

1. As S. 38 d. 28 m. is to S. 90 d. ſo is S. 23 d 30 m. to S. 39 d. 50 m. the Amplitude North, becauſe the Declination is North.

2. As T. 45 d. is to T. 51 d. 32 m. ſo is T. 23 d 30 m. to T. 18 d. 40 m. againſt which, in S. is 33 d 10 m. the Aſcenſional Difference; which being reduced into Time, is 2 hours 13 minutes; and added to 6 hours, is 8 hours 13 minutes, Sun-ſetting; which doubled, is 16 hours 26 minutes, the length of the Day.

Again

Again, 2 hours 13 min. ſubtracted from 6 hours, is 3 hours 47 min. Sun-riſing; which doubled, is 7 hours 34 min. length of the Night.

PROB. III.

Latitude of a Place, and the Sun's Declination given; to find his Altitude and Azimuth at 6 of the Clock.

To ſolve this Problem, ſay;

1. AS Radius is to the Sine of the Latitude, ſo is the Sine of his Declination to the Sine of his Altitude at 6 of the Clock.

2. As Radius is to the Sine of the Complement of the Latitude, ſo is the Tangent of the Sun's Declination to the Tangent of his Azimuth (from the Eaſt or Weſt) at 6 of the Clock.

Note; The Azimuth is from the Eaſt at 6 in the Morning, and from the Weſt at 6 after Noon: Northerly in North-Latitude, but Southerly in South.

Example.

In Latitude 51 d. 32 m. North, the Sun's Declination being 23 d. 30 m. North; What is his Altitude and Azimuth at 6 of the Clock?

Anſwer; His Altitude is 18 d. 12 m. and his Azimuth is 15 d. 10 m. Northerly, or 74 d. 50 m. North Eaſterly or Weſterly. For it is thus,

1. As S. 90 d. is to S. 51 d. 32 m. ſo is S. 23 d. 30 m. to S. 18 d. 12 m. the Altitude at 6 of the Clock.

2. As

2. As S. 90 d. is to S. 38 d. 28 m. ſo is T. 23 d. 30 m. to T. 15 d. 10 m. the Azimuth at 6; that is, 74 d. 50 m. North-eaſterly in the Morning; but North-weſterly in the Evening.

PROB. IV.

Latitude of a Place, and the Sun's Declination given; to find his Altitude and Hour of the Day when he is Eaſt or Weſt.

To perform this, the Proportions are theſe;

1. AS the Sine of the Latitude is to Radius, ſo is the Sine of the Sun's Declination to the Sine of his Altitude; being Eaſt or Weſt.

2. As Radius is to the Tangent Complement of the Latitude, ſo is the Tangent of the Sun's Declination to the Sine of the Hour from 6 of the Clock, when he is Eaſt or Weſt.

Note 1. The Sun is Eaſt after 6 in the Morning, but Weſt before 6 in the Evening.

2. The Hour found by the laſt Proportion being reduced into Time (by allowing 15 d. to an Hour), and added to, or ſubtracted from 6, giveth the Hour of the Day required.

Example.

In Latitude 51 d. 30 m. North, the Sun's Declination being 23 d. 30 m. North; What is his Altitude? and what time of the Day is it when he is Eaſt or Weſt?

Anſw. His Altitude is 30 d. 35 m. and the Hour of the Day is { 7 h. 21 m. Morning, when Eaſt. / 4 h. 39 m. Evening, when Weſt.

For

For it is thus,

1. As S. 51 d. 32 m. is to S. 90 d. ſo is S. 23 d. 30 m. to S. 30 d. 35 m. the Sun's Altitude being either East or West.

2. As T. 45 d. is to T. 38 d. 28 m. ſo is T. 23 d. 30 m. to S. 20 d. 15 m. The Hour from 6, which is 1 hour 21 minutes, added to 6, is 7 h. 21 m. and ſubtracted from it, is 4 h. 39 m. the former is the Time when East in the Morning, the latter the Time in the Evening when he is West.

PROB. V.

The Sun in the Equator or Equinoctial, (that is, when he hath no Declination) the Latitude of a Place, and his Altitude given; to find his Azimuth, and Hour of the Day.

This Problem is thus effected;

1. AS Radius is to the Tangent of the Latitude, ſo is the Tangent of the Sun's Altitude to the Sine of the Complement of his Azimuth, from the South in North Latitude; but from the North in South Latitude; Eaſterly in the Forenoon, and Weſterly Afternoon.

2. As the Sine of the Complement of the Latitude is to Radius, ſo is the Sine of the Sun's Altitude to the Sine of the Complement of the Hour from Noon.

Example.

In Latitude 51 d. 32 m. the Sun having no Declination, and his Altitude being 21 d. 50 m. in the

Forenoon; I demand his Azimuth, and the hour of the Day?

Anſw. His Azimuth is 59 d. 45 m. South Eaſterly; and the hour of the Day is hour 8.33 m. Morning. For it is thus,

1. As T. 45 d. is to T. 51 d. 32 m. ſo is T. 21 d. 50 m. to S. 30 d. 15 m. whoſe Complement is 59 d. 45 m. the Sun's Azimuth required.

2. As S. 38 d. 28 m. is to S. 90 d. ſo is S. 21 d. 50 m. to S 36 d. 50 m. whoſe Complement is 53 d. 10 m. or 3 hours 23 minutes; which ſubtracted from 12, gives 8 hours 33 minutes, or 33 minutes after 8 of the Clock in the Forenoon, the Time of the Day required.

PROB. VI.

Latitude of a Place, Sun's Declination, and his Altitude given; to find his Azimuth, and the hour of the Day.

The Performance of this, is thus:

1. TAke the Complement of the Latitude, the Complement of the Altitude, and the Sun's Diſtance from the Pole, (which is his Declination added to 90 d. when the Latitude and Declination is one North, the other South; but both being either North or South, it's the Complement of the Declination; and) add them together in one Sum.

2. From ½ that Sum, ſubtract (to find the Azimuth) the Sun's Diſtance from the Pole; (but to find the Hour, the Complement of his Altitude), and note the Remainder.

3. *To*

3. *To find the Azimuth, you have theſe two Proportions following;*

1. As Radius is to the Sine of the Complement of the Latitude, ſo is the Sine of the Complement of the Altitude to a 4*th* Sine. Then again,

2. As that 4*th* Sine is to the Sine of the $\frac{1}{2}$ Sum, ſo is the Sine of the Remainder to a 5*th* Sine; againſt which, in Verſed ſines, is the Sun's Azimuth from the North in North Latitude; but from the South in South Latitude.

4. *To find the Hour, theſe are the Proportions which follow;*

1. As Radius is to the Sine of the Complement of the Latitude, ſo is the Sine of the Sun's Diſtance from the Pole to a 4*th* Sine.

2. As that 4*th* Sine is to the Sine of the $\frac{1}{2}$ Sum, ſo is the Sine of the Remainder to a 5*th* Sine; againſt which in Verſed Sines, is the Hour of the Day from Noon.

Example.

In Latitude 51 d. 30 *m.* North, the Sun's Declination being 15 *d.* 10 *m.* North, and his Altitude obſerved to be 11 *d.* 30 *m.* I demand his Azimuth, and Hour of the Day?

90 d.		90 d.	90 d.
Latitude--51.30	North Declination----	15.10	North Alt. 11.30
Comp.Lat. 38.30	Sun's Diſt. from Pole	74.50	Comp.Alt. 78.30
Comp. Alt. 78.30	Comp. Latitude----	38.30	
Sun's Diſt. 74.50	Comp. Altitude----	73.30	
Sum is--191.50	Sum is----	191.50	
$\frac{1}{2}$ Sum is--95.55	The $\frac{1}{2}$ Sum is----	95.55	
Remaind. -21.05	Remainder is----	17.25	

Then to find the Azimuth, it is thus;

1. As Sine 90 d. is to Sine 38 d. 30 m. ſo is Sine 78 d. 30 m. to Sine 37 d. 20 m.

2. As Sine 37 d. 20 m. is to Sine 95 d. 55 m. ſo is Sine 21 d. 5 m. to Sine 36 d. againſt which, in Verſed Sines, is 80 d. the Sun's Azimuth from the North-eaſterly, if in the Forenoon, but Weſterly in the Evening.

And to find the Hour of the Day it is thus;

1. As Sine 90 d. is to Sine 38 d. 30 m. ſo is Sine 74 d. 50 m. to Sine 37 d.

2. As Sine 37 d. is to Sine 95 d. 55 m. ſo is Sine 17 d. 25 m. to Sine 29 d. 40 m. againſt which, on Verſed Sines, is 90 d. 30 m. or 6 hours 2 minutes, which is the hour from Noon; that is, 58 minutes after 5 of the Clock in the Morning, or 2 minutes after 6 in the Afternoon.

The Deſcription and Uſe of the SECTOR.

The Sector *deſcribed.*

1. THIS uſeful Inſtrument (may be of any Length, but) is commonly made one Foot 18 Inches, or 2 Foot-long, to open in a Joint in the middle, like a Carpenter's Rule; one Inch and a half (or more) in breadth, and of any thickneſs at pleaſure, according to the matter it's made

made of; which may be either *Box-wood*, *Ivory*, *Braſs* or *Silver*.

2. There are two ſorts of *Sectors*, known by the names of *Gunter*, and *Foſter*'s *Sector*; and are ſometimes both put on one Inſtrument; that is, *Gunter*'s *Sector* on one ſide of it, and *Foſter*'s on the other.

3. The Lines of *Gunter*'s *Sector* are theſe, *Line of Lines* (marked at the end with L.) *Line of Sines* (marked S.) *Superficies* (marked Sup.) *Solids* (marked Sol.) Line of *Metals*, Line of *Equated Bodies*, Line of *Inſcribed Bodies*, &c.

4. The Lines of *Foſter*'s *Sector*, are theſe 5; *viz.* *Line of Lines* or *Equal Parts*, *Chords*, *Sines*, *Tangents* and *Secants*; each marked at the end with its name, or firſt Letter of its name.

5. All *Sector-Lines* or *Scales*, meet at the center of the Head (where the Joint is) at the left-hand, and from thence are figured towards the right, each being twice repeated; that is, one on each Leg or Side of the *Sector* anſwering one another.

6. The *Sector* is uſeful in Projection, and in Proportion; in Projection, to reduce, or to make a Scheme to any (poſſible) magnitude; in Proportion, to work any ſtated Canon or Analogy in *Arithmetick*, *Geometry*, *Trigonometry*, *Navigation*, *Aſtronomy*, &c. of which I will give a brief Touch, yet ſo as the Learner may be informed how to apply it further.

1. *The Uſe of the Sector-Lines for Projection.*

IN Projections, it's often required to inlarge, or diminiſh the Scale, that the Draught deſigned may be of its deſired magnitude; in doing of which, are uſed Lateral and Parallel Diſtances, or Extents of the Compaſſes: And to avoid a needleſs ſaying over the ſame things, take once for all what is meant by a *Lateral* and a *Parallel Diſtance*, or *Extent of the Compaſſes.*

1. A *Lateral-Diſtance* (in any Line or Scale) is the extent or Diſtance (taken along the Length of the Line) from the beginning thereof to any Number (therein) deſired.

As for Example; The *Lateral-Sine* of 30 d. is the Diſtance of 30 from the beginning of the *Line of Sines*; and ſo is it in the *Line of Equal-parts, Chords, Tangents, Secants*, &c.

2. A *Parallel-Diſtance* (in any Line or Scale on the Sector) is the Extent or Diſtance (taken a-croſs) from any Number in any Line on one Leg of the Sector, to the like Number in the like Line on the other Leg.

Or, the neareſt Diſtance from any Number on one Leg (taken a-croſs), to the like Line on the other Leg.

As for Example; The *Parallel-Sine* of 30 d. is (ſuppoſing the *Sector* open'd to any Angle) the Diſtance from 30 in the *Line of Sines* on one Leg, to 30 in the *Line of Sines* on the other Leg.

Or, the neareſt Diſtance from 30 in the *Line of Sines* on one Leg, to the *Line of Sines* (that is to ſay, the

the Line iſſuing from the center of the Joint or Head) on the other Leg, is the *Parallel-Sine* of 30 d. In like manner is it done in any other Line.

This being underſtood, the inlarging or diminiſhing of any of the Lines; or the finding a Chord, Sine, Tangent or Secant, to any propoſed Radius, will not be difficult; yet for the Learner's farther ſatisfaction, take a General Rule.

To find a Chord, Sine, Tangent or Secant, &c. to any Radius (greater or leſſer) propoſed.

The general Rule is thus;

1. Take the propoſed Radius in the Compaſſes, and make it a Parallel on the *Sector* in the Radius of any one Line: that is, open the *Sector* till the propoſed Radius (in the Compaſſes) be a *Parallel-Chord* of 60 d. in the *Line of Chords*; or a *Parallel-Sine* of 90 d. in the *Line of Sines*; or a *Parallel-Tangent* of 45 d. in the *Line of Tangents*; or a *Parallel-Secant* of 0 d. in the *Line of Secants*; for the Chord of 60, Sine of 90, Tangent of 45, and Secant of 0 d. are equal, and each equal to Radius.

2. The *Sector* being kept at that opened Diſtance, or Angle, any Parallel-Diſtance in any Lines will be a Lateral-Diſtance on a like Line to the propoſed Radius: that is, a Parallel-Chord of 10, 20, 30, *&c.* is the Chord of 10, 20, 30, *&c.* to the propoſed Radius; alſo, a Parallel-Sine, Tangent and Secant, of 20, 30, 40, *&c.* is the Sine, Tangent and Secant of 20, 30, 40, *&c.* to the foreſaid Radius.

2. *The Uſe of the* Sector *in working Proportions.*

SUppoſing the Learner underſtands how to take a *Lateral-Diſtance* on the Line of Lines (otherwiſe called Equal-parts), on the Chords, Sines, &c. and to apply them Parallel in any Line on the *Sector*; the working of any Proportion is thus.

A General Rule to work by the Sector.

1. Take the 2*d* Term-Lateral, (that is, from the beginning of the Line to the propoſed 2*d* Term) and opening the *Sector*, apply that Extent Parallel (that is, acroſs it) in the 1*ſt* Term, there ſtay the *Sector* at that Parallel-Extent.

2. Then the Parallel-Diſtance taken in the 3*d* Term, and meaſured laterally, gives the 4*th* Term ſought for or required.

Or briefer thus;

As the Lateral 2*d* Term to the Parallel 1*ſt* Term, ſo is the Parallel 3*d* Term to the Lateral 4*th* Term.

This one Rule is ſufficient for any Proportion whatever, and will appear ſo by a few Examples.

PROB. I.

To multiply by the Line of Lines on a Sector.

The Proportion is;

AS 1 to the Multiplicand, ſo is the Multiplier to the Product.

Example.

What's the Product of 8 multiplied by 4?

The

The Analogy, or Proportion is this;

As 1 to 8, ſo is 4 to the Product 32, thus found by the *Sector* and General Rule aforeſaid.

1. In the Line of Lines; that is, the Line of Equal-parts, take the 2*d* term 8 *Lateral*; that is, from the center of the Joint, and the beginning of the Line, to 8 in the ſame Line.

2. Open the *Sector* till you fit the (foreſaid *Lateral*) Diſtance in the Compaſſes a *Parallel* in 1 and 1, or 10 and 10; that is, ſet it over from 10 to 10 at the end of the ſame Line, and now counted for 1 and 1, the firſt term; keep the *Sector* juſt at that Angle or opening.

3. The *Parallel-Diſtance* of the 3*d* term 4, that is, from 4 to 4, taken a-croſs from one Leg to the other in the ſaid Line of Lines, and meaſured Lateral, (which is from the beginning of the Line towards the end, and) it's 32 the 4*th* term, or product of 8 multiplied by 4. *Or ſhorter thus*;

As the 2*d* term 8 (*Lateral* taken) to the 1*ſt* term 10 (*Parallel* ſet), ſo is the 3*d* term (*Parallel* taken in) 4, to the 4*th* term (laterally meaſured, 32, the product as before. *Or thus*;

As the Lateral 4 to the Parallel 10, counted for 1; ſo is the Parallel 8 to the 32, as before.

PROB. II.

To divide by the Line of Lines on a Sector.

The Analogy or Proportion is this;

AS the Diviſor is to 1, ſo is the Dividend to the Quotient. Or thus,

As

As the Diviſor to the Dividend, ſo is 1 to the Quotient.

Example.

How many ſquare Yards are in 36 ſquare Feet? *Anſwer*, 4 ſquare Yards. For it is thus,

As 9 is to 1, ſo is 36 to the Quotient 4; thus to be wrought by the *Sector*:

As Lateral 1 is to Parallel 9, ſo is Parallel 36 to Lateral 4, the Yards required.

PROB. III.

To work the Rule of 3 by the Line of Lines on a Sector, *or unto 3 Numbers given; to find a 4th in Geometrical Proportion.*

The Analogy is,

AS the 1*ſt* term is to the 2*d* term, ſo is the 3*d* term to the 4*th* term required.

Example 1.

If the Diameter of a Circle be 14 Inches; What's the Circumference? *Anſwer*, 44 Inches. For the Proportion is this;

As 7 to 22, ſo is the Diameter 14 to 44, the Circumference required; by *Sector* thus wrought,

As Lateral 22 to Parallel 7, ſo is Parallel 14 to Lateral 44, the Circumference of a Circle whoſe Diameter is 14.

Example 2.

If a Plank or Board be 15 Inches broad, and 20 Feet long; How many Feet is in it? *Anſwer*, 25 Feet. For the Proportion is this,

As

As 12 to 15 the breadth, ſo is 20 the length to 25 Feet, the Content of the Board; and by *Sector* thus is to be wrought;

As Lateral 15 to Parallel 12, ſo is Parallel 20 to Lateral 25 Feet, the content of the Plank.

Example 3.

A Ship being in 42 d. 20 m. North Latitude, ſhe ſails N. E. by N. 104 Leagues: I demand the Latitude ſhe is in, and her Departure from the Meridian?

The Canons or Proportion are theſe;

1. As Radius to the Diſtance ſail'd, ſo is the Sine of the Courſe to the Departure from the Meridian.

That is, by the *Sector* thus;

As *Lateral* 104 Leagues (from the Line of Lines) is to *Parallel* Sine of 90 d. ſo is *Parallel* Sine of 33 d. 45 *m.* (the degrees of the Courſe from the Meridian) to *Lateral* 58 Leagues (on the Line of Lines) the departure from the Meridian.

Note; If 104 Leagues, taken Lateral, be troubleſom, to fit Parallel in Sine of 90 d. then take its half, or quarter Lateral; and the Anſwer will be accordingly its half or quarter: as here, if you take 52, the half of 104 L; the Anſwer would be 29, whoſe double is 58 for the Departure from the Meridian, as before.

2. As Radius to the Diſtance ſail'd, ſo is the Sine-Complement of the Courſe to the Difference of Latitude.

By

By the Sector *thus* ;

As *Lateral* 104 Leagues is to the Parallel Sine of 90 d. ſo is *Parallel* Sine of 56 d. 15 m. to *Lateral* 87 Leagues, the Difference of Latitude, by which you may find the Latitude the Ship is in, as before in the Uſe of the Gunter.

Example 4.

A Ship ſails South-eaſterly till her Difference of Latitude be 275 minutes, and the Departure be 412 minutes: I demand her Courſe and Diſtance ſail'd?

The Canons are theſe;

1. As the Difference of Latitude is to the Departure, ſo is Radius to the Tangent of the Courſe.

That is, *By the* Sector *thus* ;

As *Lateral* 412 minutes is to *Parallel* 275 minutes, ſo is *Parallel* Tangent of 45 degrees (that being Radius now) to *Lateral* Tangent of 56 d. 15 m. the Courſe from the Meridian which makes S. E. by E.

2. As the Sine of the Courſe is to the Departure, ſo is Radius to the Diſtance ſail'd.

By the Sector *thus* :

As *Lateral* 412 minutes is to *Parallel* Sine 56 d. 15 m. ſo is *Parallel* Sine of 90 degrees (that now being Radius) to *Lateral* 495 minutes, the Diſtance ſail'd.

After this manner may any Proportion be wrought by the *Sector*, which I leave for the Learner's Exerciſe.

A TABLE containing the Chief Harbours, Headlands and Iſlands in the World; ſhewing their Latitude and Longitude: Beginning the ſaid Longitude at the Meridian of London, newly Compoſed. By Andrew Wakely, *Math.*

The Sea-Coaſts of *Greenland.*

Names of Places.	Latitude D.	M.	Longitude. D.	M.	
HAcluits Headland	79	50	14	10	
Fair Foreland	79	15	14	05	
Cape Cold *the North-end of* Cherry Iſle	79	00	12	32	
lack Point, *South end of it*	78	32	13	10	
ear Sound	79	15	15	00	East Longitude
oule Sound	77	38	14	20	
ell Sound	77	34	15	39	
orn Sound	77	07	15	30	
oint Lookout	76	25	15	50	
elies Sound	79	27	18	20	
ape Barcam	78	35	18	02	
ape Blanco	78	10	18	30	
ucks Cove } Edges Iſ-	77	45	19	10	
egro Point } land.	77	10	22	30	
opeleſs Iſles	77	00	21	00	
pe Iſland	76	23	22	12	
herry Iſland	74	44	19	08	

North Latitude.

Nova

Nova Zembla.

Names of Places.	Latitude. D.	M.		Longitude D.	M.	
I ce Point	78	10	North Latitude.	66	10	East Longitude.
A dmiralties Iſland	76	10		60	20	
L angeneſs	74	55		58	00	
C roſs Point	72	25		58	12	
F retum Burrough	70	40		61	20	
M auritius Iſle	70	15		58	30	
C ape Oandenoſe	69	15		37	35	
C ape Barſo	65	50		35	25	

Sea-Coaſts from Archangel *to the* Naze *of* Norway.

A rchangel	63	22	North Latitude.	22	58
F ox Naze, *or* Cats Noes	64	42		22	35
C ape Grace, *or* Cape Bona Fortuna	65	27		26	30
C . Gallant, *or* Swetnoſe	67	11		26	00
C . Race, *or* Black-point	67	59		25	34
I land Kilduen	69	04		23	50
R iver Cola	69	05		23	50
S churtingberg Neſs	70	50		21	38
N orth Cape	71	22		18	42
A ſſumption	71	07		17	14
Z anem, *or* Sanien	70	28		13	08
L owſat, *or* Loffoet	68	30		09	16
Werro, *or* Weroy	67	38		08	28
Roſs Iſles, *or* Ruſt Iſles	67	01		08	06
Gripo, *or* Gryp	63	50		06	32
Gaſlee, *or* Breeſound	63	00		04	22
Swinee	62	40		03	46

Sea-Coaſts from Archangel *to the* Naze *of* Norway.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Katts Neſs, *or* Scuts Neſs, *or* South-Point	61	54	North Latitude.	02	42	East Longitude.
Harla Iſland, *South-end*	60	04		03	38	
Bergen	59	50		04	00	
Bommel Sound	59	00		03	40	
Out Seers	58	30		03	06	
Stafe Angor	58	57		04	20	
Naze of Norway	58	00		05	02	

Sea Coaſts in the Sound.

Wolfe Sound	58	20	North Latitude.	07	16	East Longitude.
Maerdou	58	17		07	18	
Long Sound	58	37		08	00	
Laerwick	58	40		08	34	
Loperwick	59	10		08	40	
Anſloo	59	10		09	10	
Voorderwick Holm	58	38		09	40	
Later Noſter	57	48		10	15	
Gottenburg Gat	57	16		10	18	
Lyding, *or* Munſter Gat	57	15		10	30	
Cape Kol	56	30		10	42	
Elfenburg	56	16		10	50	
Carlet Iſland, *or* Ween	56	10		10	54	
South Holm	55	50		11	00	
Falſterbore	55	02		11	05	
The Clippen, *or* Out-lyers *of* Green Iſland	56	10		14	15	
Chriſtianopoli	56	30		14	15	

Sea-Coaſts in the Sound.

Names of Places.	Latitude. D.	M.	Longitude D.	M.
Calmer	56	45	14.	44
Oeland the *South end*	56	20	14	51
Oeland the *Middle*	56	52	15	20
Oeland the *North end*	57	20	15	10
Joffer	57	17	15	10
Stikholm	57	33	14	35
Vrouwenberg	57	48	14	28
Stockholm	59	00	16	02
Iſlands Boeghſchaes	59	49	18	49
Aboo	60	38	19.	39
Raſheburgh	60	40	20	28
Bogo	60	52	23	10
Pelting Sound	60	30	24	10
Vekelax	60	46	25	18
Wyburgh	61	00	34	26
Caſt Rand, *or* Caſtrum	60	02	32	47
Narva	59	35	31	50
Revel	59	28	27	18
Nargin Iſland	59	50	28	05
Otoys Holm	59	40	21	08
Sybrichneſs *of* Dageroort	59	34	20	31
Aronsburg	58	45	21	02
Sorgholm	58	28	23	00
Parnout	58	22	23	30
Runen Iſland	58	00	22	10
Ryga	57	10	22	50
Domeſneſs	58	00	21	00
Der-Winda	57	28	19	43

North Latitude. East Longitude.

Sea-Coaſts in the Sound.

Names of Places.	Latitude. D.	M.	Longitude. D.	M.
Der-Memel	56	15	19	20
Coningsberg	55	05	19	22
Dantzick	54	30	17	05
Heel	55	00	17	05
Gotland, *the North-end*	58	00	16	49
Faro Sound				
Gotſche Sand	58	15	17	00
Gotland Wisbuy	57	38	16	10
Gotland, *the South-end*	57	00	16	00
Earth Holm	55	34	14	00
Born Holm	55	28	13	46
Camin	54	35	14	36
Jaſmond *on* Rugen	55	00	13	20
Stetin	54	15	14	40
Straelſond	54	30	12	50
Wiſmor	54	15	11	00
Lubeck	54	10	09	56
Meun	55	10	12	30
Copenhagen	55	50	11	54
Elſeneur	56	15	11	57
Anous	56	45	10	54
Leſon	57	05	10	39
The Schaw	57	26	10	00

North Latitude. East Longitude.

The Sea-Coasts of Holland *and* Flanders, *from the* Schaw *to* Calis.

Names of Places.	Latitude. D.	M.	Longitude. D.	M.
Holy Land	54	30	07	00
Hambrough	54	04	10	02
Bremen	53	50	09	02
Emden	53	34	07	42
Ameyland	53	40	06	10
Schelling	53	25	05	50
The Fly	53	15	05	28
The Texel	53	10	05	12
Amsterdam	52	40	05	17
Roterdam	52	05	05	00
Antwerp	51	37	04	52
The Brill	52	00	04	24
Middleburgh *in* Zeland	51	48	03	50
Sluys	51	38	03	47
Ostend	51	30	03	05
Dunkirk	51	18	02	25
Calis	51	13	01	52

North Latitude. East Longitude.

The Sea-Coasts about the Island of Ieland.

Grimes Hole	63	23	21	10
Gammatt Isles	63	48	20	30
Weitmunka Isles	63	17	18	17
Rook Point	64	00	19	33
Snow Hill	65	11	20	14
Fair Foreland	65	40	20	17
Rage Point	66	40	17	24
Marza	67	08	15	06

North Latitude. West Longitude.

The

The Sea-Coaſts about the Iſland of Iſeland.

Names of Places.	Latitude. D.	M.	North Latitude.	Longitude. D.	M.	West Longitude.
Grimſa	66	42		14	44	
Lange Neſs	66	26		13	00	
Bargafor Point	65	27		12	25	
Silly	64	50		15	20	
Horn Bay	63	42		15	40	
Merchants Foreland	63	52		17	06	
Mage Neſs	61	32		08	15	

The Sea-Coaſts of Scotland.

Sky Iſland	57	50		06	21	
Iſland Lewes	58	40		07	12	
Faro Head	58	53		04	05	
Schetland	60	22		00	20	
Fair Iſle	59	30		00	30	
Iſles of Orkney	58	50		02	52	
Cath Neſs	58	47		02	16	
Buchan Neſs	57	45		00	28	
Aberdeen	57	12		00	55	
Dondee	56	26		02	07	
Leith	56	03		02	45	
Berwick	55	59		02	00	

North Latitude. West Longitude.

The Coaſts of England, from Berwick to the Lizard.

Newcaſtle	54	58	N	01	40	
Shelles	55	02		01	00	
Sunderland	54	42		01	08	
Hartlepool	54	37		00	55	
Whitby	54	35		00	40	
Scarborough	54	20		00	03	

North Latitude. West Longit.

The Coaſts of England, *from* Berwick *to the* Lizard.

Names of Places.	Latitude. North Latitude. D.	M.	Longitude. East Longitude. D.	M.	
Flamborough Head	54	08	00	11	E. Long.
Burlington	54	00	00	06	
The Spurn	53	45	00	13	
Hull	53	45	00	28	W
Grimsby	53	39	00	56	
Boſton	53	09	00	00	
Linn	52	50	00	29	
Wells	53	17	01	00	
Blackney	53	24	00	55	
Cromer	53	20	01	17	
Winterton	53	02	01	22	
Yarmouth	52	55	01	28	
Alborough	52	24	01	15	
Orfordneſs	52	20	01	11	
Ipſwich	52	14	01	00	
Harwich	52	11	01	13	
Colcheſter	52	04	00	58	
Tilbury Hope	51	38	00	30	
Graveſend	51	35	00	20	
London	51	32	00	00	
Rocheſter	51	28	00	35	
Quinborough	51	30	00	37	
Marget	51	29	01	10	

The Sea Coaſts of England.

Names of Places.	Latitude. D.	M.	Longitude. D.	M.	
The North-Foreland	51	28	01	20	
Sandwich	51	27	01	09	East Longitude.
The Downs	51	25	01	21	
The South-Foreland	51	22	01	20	
Ripraps	51	13	01	25	
Dover	51	25	01	08	
Dongeneſs	51	09	00	51	
Rye	51	13	00	45	
Beachy	50	58	00	09	
Shoram	51	07	00	27	
Portſmouth	51	08	01	00	
Iſle of Wight	50	58	01	16	
Pool	51	04	01	50	
Weymouth	51	03	02	40	
Portland	50	50	02	48	
Chiddock	50	57	03	10	
Lime	50	55	03	14	
Topſham	50	47	03	47	
The Bery	50	40	03	49	
Torbay	50	42	03	28	
Dartmouth	50	37	03	36	
The Start	50	2[illegible]	03	45	
The Ediſtone	50	22	04	20	
Plymouth	50	36	04	13	
Ram-head	50	34	04	35	
Foy	50	35	04	50	
Falmouth	50	22	05	12	
Lizard	50	05	05	24	

North Latitude. — Weſt Longitude.

The Sea-Coaſts from the Lizard *to* Holy-Head.

Names of Places.	Latitude. North Latitude. D.	M.	Longitude. West Longitude. D.	M.
Lands-End	50	20	05	58
Gulf	50	11	06	06
Silly	50	07	06	45
Seven Stones	50	18	06	40
Hartland Point	51	00	04	35
Londey Iſle	51	22	04	40
Holms	51	27	03	40
Briſtol	51	32	02	40
Glocester	52	03	02	45
Caldy Iſland	51	43	05	14
Milford	51	45	05	15
St. David's-*Head*	52	00	05	22
Studwalls	52	52	04	55
Bardſey Iſle	52	43	05	10
Leverpole	53	20	03	10
Weſtcheſter	53	37	04	20
Iſle of Man, *Weſt-end*	53	45	05	00
Holy-Head	53	24	05	00

The Sea-Coaſts of Ireland.

Fair Foreland	55	05	06	30
Iſle Torre	55	00	08	30
Iſles *of* Arran	54	48	08	50
Stags *of* Broad Haven	54	07	10	05
Iſles *of* Arian	53	00	09	50
Galloway	53	05	09	20
Gally, *or* Doen's-Head	52	40	09	30
Lupis's-Head	52	24	10	15

The

The Sea-Coaſts of Ireland.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Limrick	52	34	North Latitude.	09	00	Weſt Longitude.
Blaſques	52	00		10	55	
Skillocks	51	30		10	55	
Cow and Calf	51	22		10	36	
Mizan Head	51	15		10	00	
Old Head	51	25		08	48	
Cape Clear	51	10		09	40	
Kingſale	51	50		08	40	
Cork	51	50		08	35	
Waterford	52	10		07	38	
Waxford	52	23		06	38	
Dublin	53	22		06	30	
Lambay	53	24		06	30	

The Sea-Coaſts of France.

Calis	51	03	North Latitude.	01	52	Eaſt Longit.
Diep	50	05		01	15	
St. Valery	50	00		00	56	
Sain-Head	49	44		00	04	
Roan	49	36		00	30	
Cape Barfleur	49	47		01	32	Weſt Longitude.
Cape de Hague	49	52		02	30	
Alderney	50	00		01	47	
Caskets	49	40		02	15	
Arme	49	36		02	19	
Garnſey	49	32		02	35	
Sark				02	15	

The Sea-Coaſts of France.

Names of Places.	Latitude. D.	M.	Longitude. D.	M.
Jerſey	49	20	02	00
Buskin	49	19	01	42
Choſoe	49	05	01	40
St. Maloes	48	45	01	45
Suſſe Iſles	49	00	03	22
Morlaix	48	54	03	45
Iſland de Baſs	49	00	03	57
Uſhant	48	35	05	19
Conquet	48	45	05	05
Breſt	48	25	04	25
Camarita Bay	48	25	04	28
Scarns	48	04	05	01
Parker	48	00	05	25
Weſt Penmarks	47	35	04	14
Glanants	47	33	03	50
Groy	47	35	03	30
Bell Iſle	47	19	03	10
Cardinals	47	27	03	00
Ronche Bernard	47	25	01	51
Nants	47	45	01	09
Picquelier Iſle	47	00	02	02
Heys Iſle	46	34	02	04
Baeſe	46	30	01	30
St. Martins	46	16	00	55
Oleron *on the* Main	46	20	00	54
Mamoſin	45	49	00	50
Toppar	45	36	01	55

North Latitude. West Longitude.

The Sea-Coaſts of France, Spain and Portugal.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Rochel	46	00	North Latitude.	00	30	West Longitude.
Sherrant	46	00		00	28	
Bloy	45	28		00	05	W. Lon.
Bourdeaux City	45	10		00	20	E. l
St. Sebaſtian	43	40		01	05	
Bilboa	43	41		02	04	
St. Andero	43	43		02	48	
Lyons	43	49		03	18	
Cape Pinas	44	04		04	32	
Cape Ortegal	44	08		05	30	
Cyſarga	43	38		07	16	
Cape Coriana	43	21		08	20	
Cape Finiſterre	43	10		08	20	
Iſles *of* Bajona	42	22		07	24	
Burlings	39	43		07	52	
Rock *of* Lisbon	39	00		07	28	
Lisbon	39	08		06	30	
Cape *St.* Vincent	37	00		08	25	
Cape *St.* Maria	36	52		05	48	
Cadiz	36	32		05	05	

Sea-Coaſts on the Main Continent within the Straits.

Gilbralter	36	40	North Lat.	05	18	West Li.
Malaga	36	45		02	17	
Veles Malaga	36	49		01	51	
Cape de Gat	36	47		00	08	E. l

Sea-

Sea-Coasts on the Main Continent within the Straits.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Cape Paul	37	28		01	47	
Alicant	38	20		01	50	
Cape Martin	38	46		02	56	
Cape Pallamallo	40	10		03	15	
Cape Dagofrito	41	41		05	54	
Marfelia	43	12		07	20	
Tallone	43	00		08	40	
Cape Larei	42	58		09	14	
Cape Melle	43	51		10	13	
Legorn	43	28		13	39	
Civita Vechia	41	46	North Latitude.	15	00	East Longitude.
Rome	41	50		15	45	
Naples	41	08		17	27	
Sellerno	40	51		18	08	
Pollicaltro	40	08		18	38	
Cape Spartaventa	37	46		18	52	
Cape Collam	38	50		20	16	
Gallipoli	40	08		21	40	
Cape St. Maria	39	52		22	29	
Angelo	41	31		21	38	
Ancona	43	25		19	05	
Gorro	44	57		16	11	
Venetia	45	37		17	21	
Cape Eſtria	44	40		18	46	
Sagua	44	47		20	25	
Zaro	44	05		21	15	
Salconico	44	01		22	00	

Sea-Coasts on the Main-Continent within the Straits.

Names of Places.	Latitude. North Latitude. D.	M.	Longitude. East Longitude. D.	M.
Cape Casta	43	27	21	24
Trovor	43	30	22	13
Stanio	42	57	22	47
Ragussa	42	29	23	33
Cattaro	42	21	24	23
Antavara	41	49	25	30
Hirassa	40	57	25	14
Cape Linga	40	19	24	14
Drugomastra	38	38	25	16
Castletornis.	37	45	25	08
Cape Matapan	36	28	25	29
Cape Sille	37	15	26	28
Cape Colloni	37	40	27	11
Cape St. George	39	28	26	46
Cape Pimra	40	26	26	59
Cape Degriffa	40	12	31	47
Gallipoli	40	20	32	35
Constantinople	40	56	35	09
Nicodemia	40	26	35	15
Land Miri	39	12	31	41
Cape Barbarnou	37	58	30	58
Cape Coxman	36	16	31	20
Cape Siridoni	35	35	36	00
Cape Pollipoli	35	35	38	37
Antiochia	34	54	41	00
Zidon	34	10	41	30
Joppa	32	42	39	35
Cairo	30	35	35	20

Sea-

Sea-Coaſts on the Main-Continent within the Straits.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Alexandria	30	40		35	04	
Cape Raſauſen	32	18		25	40	
Cape Riſſuta	32	58		24	02	
Cape de Solli	31	01		20	25	
Cape Mizorrata	32	18		18	36	
Chercana	34	56		13	12	
Britto	35	23		13	17	
Suſſa	36	02		12	43	
Cape Bona	37	05		12	47	Eaſt Longitude.
Tunis	36	50	North Latitude.	12	00	
Bozorat	37	30		12	26	
Bona	37	19		11	20	
Stora	37	09		10	20	
Collo	37	09		09	50	
Gigaria	37	03		09	02	
Gion	36	50		08	06	
Ragin	36	50		06	20	
Tadellis	36	48		05	00	
Algier	36	40		04	30	
Sally	36	40		04	24	
Tenez	36	30		02	54	
Oran	35	46		01	35	
Bellis	34	57		01	36	Weſt.
Wadallo	34	57		02	11	
Tangier	35	36		03	19	

Iſlands

Islands within the Straits.

Names of Islands.	Latitude. D.	M.	Longitude. D.	M.
Formentara	38	44	04	30
Ivica	39	05	04	33
Collombitta	39	50	03	20
Cabrera	39	07	05	41
Majorca	39	38	05	48
Minorca	39	55	06	52
Gallatta	37	57	11	04
Serpentera	39	00	11	54
South-End *of* Sardinia	38	56	11	13
North-End *of* Sardinia	41	10	12	01
Azemnera	41	08	10	58
South-End *of* Corsica	41	20	11	37
North-End *of* Corsica	42	55	12	02
Caprera	42	58	12	57
Lilbo	42	31	13	12
Planosa	42	07	13	09
M. Christo	41	55	13	27
Palmarolla	40	50	14	35
Ponssa	40	40	15	08
Iscia	40	46	16	12
Strombello	39	03	17	38
Volcanello	38	48	17	06
Fellicur	38	43	16	37
Allicur	38	45	16	23
Ustica	38	50	15	34
West-end *of* Sicilia	37	52	14	43
Middle *of* Sicilia	37	42	16	45
East-End *of* Sicilia	37	07	18	00

North Latitude. East Longitude.

Islands

Islands within the Straits.

Names of Islands.	Latitude. North. D.	M.	Longitude. East. D.	M.
Mettina	38	07	17	57
Zambra	37	10	13	10
Pantalaria	36	53	14	11
Linoſſa	36	20	14	41
Lampadoſa	35	58	14	35
Sematto	35	46	14	15
Gazo	36	15	15	27
Cominò	36	15	16	00
Malta	36	00	16	30
Iſland Grozo	44	00	20	12
Poma	43	14	20	24
St. Andrea	43	07	20	34
Buze	43	02	20	54
Liſſa	43	00	21	09
Caſſo	42	44	21	34
Agoſta	42	36	21	59
Corſena	42	53	22	14
Mellida	42	37	22	39
Farmo	39	44	23	55
Corfu	39	25	24	02
Cape Sidro	38	15	24	09
Zante	37	37	24	14
Sapentia	36	47	24	52

Islands in the Archipelago.

Taſſo	40	00 North.	29	55 East.
Lemnos	39	41	30	25
Mettalin	38	54	30	28

Islands

Islands in the Archipelago.

Names of Islands.	Latitude. D.	M.	Longitude. D.	M.
Ipsera	38	28	29	57
Schyro	39	00	28	45
Scatto	39	42	27	27
Scopollo	39	23	27	53
Hilladromo	39	34	28	02
Largor	39	47	28	31
Tino	37	55	28	49
Sia	37	38	28	27
Fermenia	37	28	27	54
Serfanto	36	58	28	15
Millo	36	40	27	45
Levallo	36	38	29	30
Stampalia	36	11	29	35
West-End of Candia	35	15	27	01
Middle of Candia	35	08	28	32
East-End of Candia	35	04	30	08
Rhodes	35	40	31	58
West-End of Cyprus	34	22	36	23
Middle of Cyprus	34	18	37	45
East-End of Cyprus	34	48	38	54

North Latitude. East Longitude.

The Sea Coasts of Barbary and Guinny, from Tangier to Sampson's River.

	Latitude. D.	M.	Longitude. D.	M.
Tangier	35	36	05	35
Cape Cantin	32	27	06	30
Cape de Geer	30	30	06	50
Cape Gilon	29	50	06	53
Cape de Non	28	52	07	10

North Latitude. West Longitude.

The

The Sea-Coasts of Barbary *and* Guinny, *from* Tangier *to* Samplon's *River.*

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Marpeiueno	27	22		07	35	
Cape Borador	26	55		08	16	
Cape Blanco	20	30		14	50	West Longitude.
Cape de Verd	14	30		17	45	
River *of* Gamboa	12	47		07	41	
Cape Roxo	11	38		13	37	
Cape de Monte	05	23		10	05	
River de Casto	05	20	North Latitude.	01	36	
Cape de Palmas	04	00		01	01	
River *St.* Andrea	05	23		02	42	
Cape Corce	0					
Cape Three Points	04	10		07	36	
River de Valta, *or* Acara	06	05		11	28	East Longitude.
River de Lagos, *or* Arda	07	40		14	25	
River Benin	06	50		16	48	
Cape Formosa	04	03		17	28	
New Callabar	04	40		18	13	
Old Callabar	04	50		19	51	
Sampson's River	04	22		20	28	

Sea Coasts from Guinny *to* Cape-Bon Eiperance.

River de Gamarones	04	00		21	45	
River Borra	02	42		22	05	
Island Fernandepo	03	10	North.	20	42	East.
Island de Principe	01	50		19	50	
River de Anger	01	00		22	06	
River Gabon	00	10		12	52	

Sea

Sea-Coaſts from Guinny *to* Cape Bon Eſperance.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Iſland Chocos	00	40	N.L.	18	26	
Iſland *St.* Thome	00	10		18	10	
Iſland *St.* Matheos	01	40		02	21	East Longitude.
Iſland Aſcenſion						
Iſland Anabona	01	22		17	32	
Cape Lopas	01	00		20	07	
Cape Padro	06	00	South Latitude.	23	40	
Cape Ledo	10	00		23	59	
Cape Negro	16	30		22	11	
Baſſas	17	45		17	34	
St. Hellena Nova	16	03		14	24	
St. Hellena	16	03		05	30	W.
Cape Secos	29	40		24	50	East Long.
Cape Bon Eſperance	34	25		27	30	
Cape Anguillas	36	20		28	30	
Iſland Garlaice	37	56		06	40	
Iſland Triſtian	36	57		06	10	

The Sea-Coaſts of Brazilia.

River de Plata	35	50		44	50	
Cape *St.* Maria	35	00	South Latitude.	42	35	Weſt Longitude.
Cape Frio	22	52		30	07	
Cape *St.* Thome	21	47		29	02	
Iſland de Picos	21	52		11	15	
Iſland de Martin	19	00		13	27	
St. Maria de Agoſta	19	38		18	08	
Trinidada	19	50		19	48	

The Sea-Coasts of Brazilia.

Names of Places.	Latitude. D.	M.		Longitude. D.	M.	
Iſland Aſcenſion	19	19	South Latitude.	22	25	West Longitude.
St. Harbara	18	11		26	30	
Cape de Abiolho	17	52		27	06	
River Grande	14	49		27	30	
River Real	11	21		26	05	
River *St.* Miguel	09	30		24	35	
Cape *St.* Auguſtine	08	25		28	32	
Cape *St.* Raphael	06	10		25	00	
Abrotho	05	00		23	20	
Iſland Farnando	03	40		25	00	
Rocas	03	42		22	40	
Cape Blanco	02	25		27	53	
Iſland Aſcenſion	07	48		25	30	
Iſland *St.* Paul	00	55	N.	25	00	

Sea-Coaſts on the Main-Continent in the Eaſt-Indies.

Bay de Allagoa	33	18	South Latitude.	38	35	Eaſt Longitude.
River *St.* Lucia	28	25		40	45	
Cape *St.* Martin	25	40		41	35	
Cape Corientes	23	30		43	27	
I. de Aguada	15	17		48	02	
Cape Falco	08	02		47	00	
Tangoa	05	20		46	37	
Molinde	02	42		46	47	
River de Lamo	01	20		46	53	
Magadoxo	02	30	Nor.	54	00	
Cape de Baſſos	04	30		59	55	

Sea-

Sea-Coasts on the Main-Continent in the East-Indies.

Names of Places.	Latitude. D. M.	Longitude. D. M.
Cape de Guardelin	11 40	66 00
Aden	13 08	61 32
Cape de Matriaca	15 33	67 15
Dofar	17 00	69 40
Cape duas Pointas	18 19	73 45
Cape Rafolgate	22 07	79 15
Cape Mozando	25 32	77 15
Godo	24 50	84 04
River de Sinda	24 55	90 15
Dio	20 48	91 03
Surat	21 00	94 12
Daman	19 54	93 37
Chaul	18 10	93 27
Dabul	17 01	93 31
Goa	14 40	91 37
Mangualar	12 40	91 55
Callant	10 48	92 03
Cochin	09 40	92 05
Cape Comorin	07 50	92 15
Naga Patam	11 21	94 35
Armegon	14 35	95 03
Sambron	18 30	103 28
Aicopoir	20 19	107 15
River Bengale	22 09	116 09
River de Caera	10 45	113 30
Quada	06 47	112 90
Mallacca	01 41	110 50

North Latitude. East Longitude.

Iſlands in the East-Indies.

Names of Iſlands.	Latitude.		Longitude.	
	D.	M.	D.	M.
Romeyros	28	19	73	57
John de Lisbon	25	24	63	08
Diego Roys	20	05	69	30
St. Brandon	17	13	69	20
Mauritius	20	10	63	20
Don Maſcharinnas	20	50	61	30
St. Apollonia	20	50	60	30
South End *of St.* Laurence	25	37	55	30
Middle *of St.* Laurence	18	30	51	05
N. End *of St.* Laurence	11	03	58	25
John de Nova	17	20	50	05
St. Chriſtopher	14	30	50	39
Mayotta	12	40	52	31
Joanna	12	09	51	39
Mohilla	12	11	51	01
Comaro	11	20	50	24
Manſia	07	50	47	44
Zanzibar	06	25	48	11
Pemba	05	09	48	06
John de Comaro	09	00	51	56
Coſmoledo	09	40	56	28
John de Novo	09	00	58	02
Aſſores Ilheos	09	05	59	38
Agalega	09	00	60	51
De Almicanta	03	57	58	04
Iſland Quehallo	03	40	58	56
Set Hermanos	03	02	65	01
Diego Gratioſa	08	03	72	51
Piedros Blanco	06	10	71	31

South Latitude. East Longitude.

Iſlands

Islands in the East-Indies.

Names of Islands.	Latitude. D.	M.		Longitude. D.	M.	
Socotora	12	18	North Latitude.	68	37	East Longitude.
Island de Zocha	11	22		85	21	
Cubolla	08	53		85	43	
Molaque	09	05		86	05	
Garipa	10	50		85	32	
Qualpena	10	32		86	34	
Andomaon	11	30		85	27	
Ceylon	07	50		93	15	
Island Cocos	14	30		109	48	
Island d' Andemanio	13	00		109	15	
Quarinibar	11	10		109	20	
Island Rase	09	52		109	09	
Island de Sombrese	08	00		109	20	
Nicobars	07	00		109	40	
North-end *of* Sumatra	05	28		111	15	
Middle-End *of* Sumatra	01	30	South Lat.	115	25	
South-End *of* Suuatra	05	52		120	24	
Jambe	01	49		117	01	
Bantam	06	15		110	10	

The Southern Islands.

St. Antonio	17	07	North Latitude.	26	40	West Longitude.
St. Vincent	16	55		25	56	
St. Lucia	16	50		25	32	
St. Nicholas	16	30		24	48	
I. de Sall	17	00		22	30	
Bonavista	15	58		22	23	

The Southern Iſlands.

Names of Iſlands.	Latitude. D.	M.		Longitude. D.	M.	
Mayo	15	00	North Latitude.	23	06	Weſt Longitude.
St. Jago	14	52		24	06	
Fuogo	14	42		25	20	
Brava	14	49		25	38	
Vegie	12	26		29	12	
Vegie	11	12		31	30	
St. Paul	01	32		25	20	
Abrotheos	00	00		26	00	

The Canary *Iſlands.*

Porto Sancto	33	14	North Latitude.	16	49	Weſt Longitude.
Madera	32	27		18	10	
Dezartes	32	08		17	50	
Salvages	30	05		17	30	
Palma	28	58		19	06	
Ferro	28	05		20	07	
Gomera	28	09		19	00	
Tenariff	28	20		17	30	
Grand Canaria	27	43		16	35	
Allegranſa	29	11		14	07	
Lancerotta	28	51		14	12	
Forteventura	28	12		14	52	

The Weſtern *Iſlands.*

Abrojo	38	55	North.	25	40	Weſt.
Vegie	40	30		25	42	
Corvo	40	09		32	23	
Flores	39	30		32	19	

The

The Weſtern *Iſlands.*

Names of Iſlands.	Latitude. D.	M.		Longitude. D.	M.	
Fial	38	49	North Latitude.	35	37	Weſt Longitude.
Pico	38	30		29	00	
St. George	39	00		28	44	
Tercera	39	31		27	46	
Gratioſa	39	30		28	15	
Abrajo	39	52		24	17	
Vajo	38	43		23	47	
St. Michael	38	00		25	40	
Formigas	37	25		24	00	
St. Maria	37	00		24	20	
Vegie	42	22		24	20	
Iſland Verda	44	48		28	50	
Maiden Iſland	46	30		20	00	
Old Brazeel	51	03		16	50	

The Sea Coaſts of Hudſon's-Bay, New-found-land, *and* New-England.

Cape Farewell	60	00	North Latitude.	48	50	Weſt Longitude.
Iſland Reſolution	61	30		68	30	
Port Nelſon	57	10		96	20	
C. Henerita Maria	55	00		87	12	
Charlton Iſland	52	10		83	00	
Rupert's River	51	32		83	15	
Groy	51	10		54	10	
Bell-Iſle	51	03		44	08	
Penguin Iſland	50	02		52	46	
Cape Bonaviſta	49	19		53	09	

The Sea Coaſts of Hudſon's-Bay, New-found-Land, *and* New-England.

Names of Places.	Latitude. North Latitude. D.	M.	Longitude. West Longitude. D.	M.
Trinity Bay	48	55	54	28
Baçalao	48	39	52	19
Conſumption Bay	48	20	53	13
Cape *St.* Francis	47	44	52	51
Cape Diſpair	47	22	51	27
Ferryland Head	46	50		
Cape Race	46	28	51	54
Bay *of* Bulls	47	27	52	35
St. John's Harbour	47	48	52	45
Plaſentia Bay	47	33	53	05
Cape *St.* Larinſo	47	09	54	23
Iſland *St.* Paul	47	37	55	42
Cape Roy	48	05	58	13
Cape d' Games	54	00	58	45
Cape *St.* Charles	52	47	57	47
Cape Britain	46	00	58	21
Cape Sable	43	45	63	30
Cape Codd	42	[illegible]	68	30
Boſton	42	38	70	00
Plimouth	42	08	68	01
Nantucket	41	09	65	41
Martin's Vineyard	41	18	66	36

The Sea-Coaſts on the Main Continent in the West-Indies.

Names of Places.	North Latitude. D.	M.	West Longitude. D.	M.
Elizabeth's Iſland	41	03	67	30
Block Iſland	40	55	68	00
Long Iſland	40	45	68	40
Cape May	39	55	70	09
Cape Charles	37	48	73	15
Cape Henry	37	00	74	02
Cape Hattaras	35	50	73	10
Cape Feare	34	02	75	20
Cape Carnavaral	28	40	79	15
Cape Florida	24	46	80	00
Laphillipina	30	17	84	28
Cape de Catocha	21	23	86	01
Cape de Camaron	16	05	81	43
Cape de Gratias	15	32	76	20
Cartagena	10	25	70	30
Bay Fonto	12	10	68	00
Cape Roman	11	55	66	00
Cape Codera	11	08	62	02
Cape Three Points	11	18	61	05
Cape Breme	09	20	59	40
Cape Dasbaſſas	08	20	58	35
Suramo	06	10	56	20
Suranam	05	55	55	16

Iſlands in the Weſt-Indies.

Names of Iſlands.	Latitude. D.	M.	Longitude D.	M.
Iſland Fonſeca	12	24	53	54
La Barmudos	32	25	63	30
Behama	27	57	78	30
Teavis	27	27	76	28
Siguatro	26	18	74	09
Guarao	25	47	73	24
Guanima	25	15	73	17
Triangulo	24	33	71	54
Guanaimo	23	50	72	03
Mayaguana	23	05	72	15
Cacos	22	05	69	55
Amiana	21	40	70	02
Nagua	21	19	72	27
Yamatta	22	32	73	13
Samane	24	20	74	14
Yamia	24	22	75	34
Jabaqua	25	10	76	54
St. John	18	30	66	06
St. Cruſe	17	42	64	42
Anguilla	18	48	62	24
St. Martin	18	35	62	11
St. Bartholomew	18	15	61	57
Barbada	17	18	61	03
Antego	16	32	60	16
Deſſeda	16	00	60	00
Marigallanta	15	41	60	50
Dominica	15	00	60	29
Martineco	14	20	60	08

North Latitude. West Longitude.

Iſland

Iſlands in the West-Indies.

Names of Iſlands.	Latitude. North Latitude. D.	M	Longitude. West Longitude. D.	M.
St. Lucia	13	30	60	07
Barbadoes	13	10	57	24
Tobago	11	12	58	30
Point de Gallera	10	45	58	55
Granada	12	10	59	56
St. Vincent	12	50	59	52
Guardalupa	16	00	60	55
Monſerat	16	20	61	05
Mevis	17	00	61	51
St. Chriſtopher	17	30	62	09
Iſland Blanco	12	20	62	16
Margarita	11	28	62	01
Tortuga	11	30	63	04
I. d' Orchita	12	19	63	25
Iſland Aves	12	29	64	46
Boniaire	12	32	65	18
Querifa	12	25	66	03
Aruba	12	45	66	46
East-End *of* Hiſpaniola	18	47	67	52
Middle *of* Hiſpaniola	18	50	70	22
Weſt-End *of* Hiſpaniola	18	25	73	50
East-End *of* Jamaica	18	00	75	30
Port Royal	18	15	76	45
Weſt-End *of* Jamaica	18	38	79	21
The East-End of Cuba	20	27	72	30
The Middle of Cuba	22	00	81	20
The Weſt-End *of* Cuba	22	30	84	30

Iſlands in the West-Indies.

Names of Iſlands.	Latitude. D.	M.		Longitude. D.	M.	
Caimanis	19	41	North Latitude.	83	05	West Longitude.
Grand Caiman	19	21		80	30	
Santavilla	17	28		83	14	
Moſquito	14	50		81	28	
Guanabo	16	33		86	43	
Guanabimo	16	10		88	28	
Cozumal	19	25		90	20	
Laſalleiranas	22	00		93	22	
Iſland Delas	23	30		97	22	
Abraio	25	50		99	24	
Labarmaio	22	55		98	40	
Iſland d' Arenas	22	36		98	38	
Zarka	20	50		98	24	
Iſland *of* Providence	13	27		80	00	
St. Andrea	12	42		86	21	

OF THE Latitude and Longitude OF PLACES.

Latitude and *Longitude* are two primary Affections of the Earth: By the help of theſe two doth the *Geographer* ſtrive to repreſent the Parts of the Earth, that they may keep ſymetry and harmony with the whole.

Latitude is an Arch of the Meridian, comprehended between the Equinoctial and a Parallel. But *Longitude* is an Arch of the Equinoctial, intercepted by the Meridian of *London*, and the Meridian of any other place.

For the exact ſettling of Latitudes, we have many abſolute helps; but the Longitude of a Meridian, is that which hath, and ſtill wearieth the greateſt Maſters of Geography.

I have endeavoured to ſettle the Longitude with as much exactneſs as poſſibly I could: for I not only calculated according to the Latitude and Meridian-Diſtance of each Place from the Meridian of *London*; which Meridian-Diſtance I obtained from the exacteſt *Geographical Charts* extant; but I conſulted with the Reckonings of ſkilful and able Mariners; and when

I found any difference, I compoſed it both according to Art and Reaſon.

As for inſtance, I had from skilful and able Mariners, upon their long experience, the Meridian-Diſtance from *Barbadoes* to the *Lizard*: According to which I have ſettled the Longitude of all the eminent Places in the *Weſt-Indies*.

And for the ſettling of the Longitudes of the Places in *Eaſt-India*, I conſulted Obſervations of Eclipſes, both Antient and Modern, as in 161 Page of *Harmonicon Cœleſte*, the Difference of Meridians between *Goa* and *London*, is 5 h. 48 m. and *Malico* and *London* is 7 h. 19 m. My Table hath the former of theſe 6 h. 6 m. and the latter 7 h. 23 m. the Difference between my Table and the former of theſe Obſervations is 18 m. and of the latter is 4 m. which Difference may be born withal.

Note 1. I do begin the *Longitude* at the *Meridian* of *London*, and increaſing it on both ſides the ſaid Meridian; that is to ſay, both *Eaſtward and Weſtward*, and terminate at 180 deg.

2. Therefore (according to this account) all Places on the Eaſt-ſide of the Meridian of *London*, lie in *Eaſt Longitude*: and on the contrary, all on the Weſt-ſide of it, lie in *Weſt Longitude*.

3. If a Ship be in *Eaſt Longitude*, ſailing to the *Eaſtward*, *the Longitude increaſeth*; but ſailing to the *Weſtward*, *the Longitude decreaſeth*.

4. And on the contrary, If a Ship be in *Weſt Longitude*, then ſailing to the *Weſtward*, *the Longitude increaſeth*, and ſailing to the *Eaſtward it decreaſeth*.

5. Th

5. Take notice, that to Places in *Eaſt Longitude*, the Sun cometh on their Meridian before he cometh on the Meridian of *London*. As if a Place lie in 15 Degrees *Eaſt Longitude*, the Sun cometh one Hour ſooner to the Meridian there, than he doth to the Meridian of *London*: If in 30 d. *Eaſt Longitude*, then two Hours ſooner, if 45 d. three Hours ſooner, if 60 d. four hours ſooner, if 75 d. five hours ſooner, if 90 d. ſix Hours ſooner; if 105 d. ſeven hours ſooner; and ſo you may reckon for any other Longitude.

But on the contrary, All thoſe Places that lie in *Weſt Longitude*, the Sun or Star cometh on their Meridian after he is paſt the Meridian of *London*.

To find the Difference of Longitude *between any two Places.*

IF both Places be in *Eaſt* or in *Weſt Longitude*, ſubtract the leſſer Longitude out of the greater, and the Remainder is the Difference of Longitude.

If one Place be in *Eaſt Longitude*, and the other in Weſt, add both together, and their Sum is the Difference of Longitude.

FINIS.

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